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USSR Report

ENERGY

No. 6

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ELECTRIC POWER

USSR POWER SUPPLY, INTERBLOC COOPERATION VIEWED

Moscow AGITATOR in Russian No 22, Nov 79 pp 39-42

[Article by P. Neporozhniy, USSR Minister of Power Engineering and Electrification: "A Key Sector of Economics"]

[Text] The Communist Party is devoting unabated attention to further strengthening the energy base of the Soviet economy. At the November (1978) Plenum of the CPSU Central Committee, comrade L. I. Brezhnev named the fuel-energy sector among the key ones. The growth rates of the economic power of the country and the solution of the most important social problems depends, to a decisive extent, on the level of power engineering development.

Power engineering and electrification are the basis for technical advance in all sectors of the national economy. But power engineering itself should be developed on the basis of the newest technology and improvement in the methods and means for design and management. Therefore, the decree of the CPSU Central Committee and the USSR Council of Ministers "On Improvement of Planning and Strengthening the Influence of the Economic Mechanism, on Improvement of Production Efficiency and Work Quality" is of paramount significance for our industry. All of the provisions of this document relate directly to power engineering: on accelerating the realization of scientific-technical discoveries and developments, the efficient use of production funds and resources, the correct determination of priorities in development of the industries. Moreover, this sector has its own specific nature which consists, in particular, of the fact that the use and production of power occurs simultaneously; it may not be stored in a warehouse. Specific measures directed at improving the economic mechanism, including new, more accurate planning indicators in the power producing sub-industries, provisions for the further development of cost accounting, and strengthening the role of economic levers are being developed taking this and other features into account.

During the 10th Five-Year Plan, Soviet power engineering is developing very rapidly in accordance with the decisions of the 25th CPSU Congress, more than in any other country in the world. For the current year alone, the rated capacity of the electric power stations will grow by more than 12 million kilowatts. This is more than the total capacity of the USSR's electric power stations in the pre-war year of 1940. Electric energy capacities will increase by more than 40-million kilowatts just during the four years of the current five-year plan. About 40 years were required for the creation of such capabilities after the formation of the Soviet state.

Electric power production should reach 1.250-1.265 trillion kilowatt hours this year. This means that annual output since the beginning of the five-year plan will increase by more than 220-billion kilowatt hours. This increase alone is almost equal to the electrical energy production in such a developed capitalist country as France for one year.

The current five-year plan in the industry is characterized not only by quantitative growth, but by serious qualitative changes as well. We are speaking first of all about the concentration of power production at large electric power plants and plants with high unit-power ratings.

Three-hundred-thousand kilowatt power units were the basic ones in the preceding five-year plan in thermal power engineering; now plants with a capacity of 500,000 and 800,000 kilowatts are being built and successfully operated. Installation of a unique power unit, the first in the country, rated at 1.2 million kilowatts, is being completed at the Kostromskaya GRES [State Regional Power Plant].

The idea of the Leninist GOELRO [State Committee for the Electrification of Russia] plan for concentration of plants is also being successfully realized in water power. 300,000 and 500,000 kilowatt hydraulic turbines are in operation at the Nurekskaya and Krasnoyarskaya hydro-electric power stations (GES). And last year the first power units rated at 640,000 kilowatts was put into operation at the Sayano-Shushenskaya GES. One million kilowatt reactors are being started up one after another at nuclear power plants. And work on the creation of reactors with a unit rating of 1.5 million kilowatts is under way. Under the conditions of increasing demands for electrical energy and increased requirements for more economy in its production, outfitting electric power plants with just such large installations is the most proper approach.

Another of the most important Leninist principles for electrification, centralization of electric energy distribution, is continuing to be carried out at a higher qualitative level. The Unified Power System of the Soviet Union [YeES USSR] is being expanded and improved. Last year the Unified Energy System of Siberia with such giants as the Bratsk, Krasnoyarsk, Ust-Ilimsk and the Sayano-Shushenskaya (under construction) GES joined together with it last year. Today the Unified Energy System of the USSR is the largest energy association in the world. More than 900 electric power plants with a total capacity of 210-million kilowatts, constituting 82.6 percent of the rated capacity of all of the country's electric power plants are included in it. Electronically controlled from the central control board in Moscow, the USSR Unified Electric Power System extends 7,000 kilometres from Kalinigrad and L'vov to the banks of the Angara and Yenisey. It encompasses a territory equal to the area of the USA, 6 time zones. This kind of centralization makes it possible to switch the capacities of electric power plants around, transferring energy great distances as a function of changing demands in various regions of the country, to insure more reliable energy supply to consumers and to conserve fuel resources. The availability of the country's Unified Electric Power System provides a gain equivalent to the addition of power plants with a capacity of 12-million kilowatts.

Our Unified Electric Power System is being improved by creating powerful electric transmission lines rated at 500,000 and 750,000 volts, which join the energy systems of various economic regions. Superhigh-voltage lines are being designed and are already being run. For example, there is the unique electric transmission line rated at 1.15-million volts ac which will join the thermal stations being constructed in the Kansko-Achinskiya coal basin with Novokuznetsk. Preliminary work for creation of a 1.5-million-volt dc line is in progress. It will join the Ekibastuz Electric Power Stations in north Kazakhstan with the center of the country.

Let us dwell briefly on the development of the individual sectors of power engineering.

As has already been mentioned, in the thermal sector a course has been set for the creation of large scale electric power plants with high unit-output plants. I will mention the Zaporozhskaya and Uglegorskaya, State Regional Power Stations (GRES), the largest in Europe, rated at 3.6-million kilowatts, where units of the new generation, the "800,000-watters," are in operation along with 300,000-kilowatt power units.

The distributional geography of such stations is changing. Thermal power engineering is developing primarily in the eastern regions of the country, close to the economical fuel supplies (cheap coals and natural and by-product gas). The creation of a series of very large electric power stations rated at 6.4-million kilowatts with 800,000-kilowatt power units has been planned in the region of the Kansko-Achinskiya coal basin in Siberia. At the first of them (the Berezovskaya GRES-1), preliminary operations are already under way.

Another group of electric power stations will operate on coal from the Ekibastuzskaya in northern Kazakhstan. It has been planned to construct four stations rated at 4 million kilowatts in this region. The first 500,000-kilowatt power unit at the Ekibastuzskaya GRES-1 will go on line this year and the second is already being installed. The Reftinskaya GRES, the largest in the Ural Mountains, is already operating on Ekibastuzskiy coal. Two more 500,000-kilowatt power units have been added to the 300,000-kilowatt units there during the last two years, and a third with the same capacity will be put on line towards the end of this year.

The by-product gas at the small-scale petroleum plants of Tyumenskaya Oblast is already being used by the Surgutskaya GRES. Several more gas-fired GRES will be built in this region.

In the 10th Five-Year Plan water power is developing primarily in the eastern region of the country, in Central Asia and Transcaucasia. Much has been done this year. Recently construction of the Nurekskaya GES, which was brought up to full power (2.7-million kilowatts) was recently completed in Tadzhikistan in Georgia. Installation of the fourth unit of the Ingurskaya GES is being completed. The builders of the Sayano-Shushenskaya GES, the largest in the world, have promised to start the second hydraulic turbine by 7 November and the third for the "Day of the Power Worker," 22 December. A series of hydraulic units will be put into use at GRES in the European part of the country.

Nuclear power engineering is developing rapidly. Let us recall that a quarter century ago the first nuclear power station in the world made current in our country. The capacity of its reactor was 5,000 kilowatts in all. The introduction of nuclear stations rated at more than 13-million kilowatts is specified during the current five-year plan. Such stations are being constructed in the European part of the country, where most of the electric power is used and where fuel reserves are limited and its shipment from beyond the Urals is becoming more complex and costly. The nuclear power stations are permitting us to solve this problem. Just one of their power units with a capacity of one-million kilowatts will save 2.8-million tons of coal during the year, for transportation of which 50,000 railroad cars would be required. Just a few cars will be required for transportation of the nuclear fuel required for replacing this amount of coal.

The builders and installation workers at nuclear electric power stations will celebrate the "Day of the Power Worker" this year with the start-up of new one-million kilowatt reactors at the Leningradskaya, Chernobyl'skaya and Kurskaya nuclear power stations (AES) and the first "million-watter" at the Novovoronezhskaya station. A second power unit rated at 410,000 kilowatts is being put into operation at the Armyanskaya nuclear plant. The builders of the Beloyarskaya AES, where start-up and adjusting operations are underway at the largest nuclear reactor working on fast neutrons in the world is underway, are solving a critical problem. There is a great future for this type of units: consuming one type of nuclear fuel, they reproduce the same quantity of another nuclear fuel.

Scientists and specialists are solving the problem of creating nuclear heat and electric power stations for large cities. There is already this type of experience at hand: the first in the world, the Bilibinskaya nuclear heat and electric power station (TETs), which provides this remote region not only with electric but with thermal energy as well, is in operation on the Chukotsk peninsula.

The power workers are devoting much attention to electrification of agriculture. It is anticipated that this year the volume of electric power consumption in the village will increase by 31-billion kilowatt hours in comparison with the start of the current five-year plan and will reach 105-billion kilowatt hours. And it wasn't so long ago, in 1952, that the entire country used that amount of electric energy. Serious problems have been posed before the power workers by the decree by the CPSU Central Committee and USSR Council of Ministers' decree "On Measures for the Further Development of Electrification of Agriculture," published in February 1979.*

The whole world is preoccupied today with the problem of providing energy. Our country is rich in energy resources and a fuel shortage does not threaten us. Nevertheless, fuel economy is a primary task. It is adequate to say that thermal electric power stations consume approximately 40 percent of all of the fuel going for production use. Therefore, an intense battle for cautious, efficient use of literally each gram of fuel is underway in the industry. To reduce fuel consumption by just one gram in the production of a single kilowatt hour of electricity means, on the national scale, to conserve one million tons of conventional fuel per year.

In the three years of the current five-year plan, the specific fuel consumption to produce one kilowatt hour of electric power has been reduced by 9 grams. Achieving a further saving of two grams per kilowatt hour has been specified by the socialist pledges of the industry's workers, an act which will permit us to save more than 2-million tons of conventional fuel. The collectives of the Kostromskaya, Karmanovskaya, Sredne-Ural'skaya, Iriklinskaya, Reftinskaya, Zaporozhskaya, and other thermal electric power stations are achieving the highest successes.

Increasing the industry's efficiency and work quality is determined, to a decisive extent, by the development of an active socialist competition. The foremost collectives of power workers have made increased commitments for the fourth year of the five-year plan and are successfully fulfilling them. Thus, the builders and operations experts of the Reftinskaya GRES are competing for early start-up of the third power unit rated at 500,000 kilowatts. A contest for economic, reliable work in each shift has been developed based on the initiative of "G" shift collective at the Kashirskaya GRES: fuel conservation, and insuring optimal parameters and reliable equipment operation. This start was caught up by the collectives of all of the electric power stations in the "Mosenergo" [Moscow regional management of the power industry] system. During the course of the competition, the power workers of the Kashirskaya GRES have saved about 2,000 tons of conventional fuel. The title "Best Equipment Operator of the Power Unit" was conferred on an operator at this station, S. A. Sorvutin for successful fulfillment of commitments this year.

G. A. Filonenko, an equipment operator on a power unit at the Uglegorskaya GRES came forward with the patriotic initiative "My Personal Contribution to the 10th Five-Year Plan." He was awarded the honorary title of Laureate of the USSR State Prize for successes in the competition for saving of fuel and for accident-free equipment operation. This year G. A. Filonenko's initiative has already been supported by 7,000 workers in the industry.

The competition of units working together closely according to the principle of the "working competition", started by the members of the Nurekskaya GES, has received broad dissemination by the energy builders. The successful fulfillment of pledges by participants in the "working competition" made it possible to bring the station to rated output one year earlier than the planned deadline. This remarkable victory of labor was noted by the greeting of comrade L. I. Brezhnev. Today the "working competition," is operating effectively in construction of the Ust'-Ilinskaya GES, the Armyanskaya AES and other electric power stations.

The initiative of the 28 Leningrad enterprises and organizations which came forward with a proposal for collaboration with the builders of the Sayano-Shushenskaya GES is widely known. Such cooperation, including about 200 enterprises and organizations in various cities of the country already, is aiding in the shortening of deadlines for construction of the giant on the Yenisey River. This example is being followed at other stations today. Thus the collective of builders of the Ekibastuzskaya GRES-1 organized a labor competition with 39 machine-building enterprises who are equipment suppliers.

Members of M. P. Mashchenko's brigade from "Krasnoyarskgesstroy" have urged competition for the broad introduction of brigade sub-contracting and new equipment. M. D. Ivchenko's brigade building the Chernobyl'skaya AES has proposed that there be competition to achieve the highest output with the smallest crew.

The Motherland highly values the selfless labor of the power worker. There are 229 Heroes of Socialist Labor among the industry's workers and this high title has been awarded to A. A. Ulesov and A. P. Aleksandrov twice. Thirteen power workers are Laureates of the USSR State Prize; this award was conferred on them for outstanding labor achievement. A. V. Jurochkin, Senior Equipment Operator at the Sredne-Ural'skaya GRES power unit, A. G. Sabirzyanov, Senior Equipment Operator at the Karmanovskaya GRES power unit, and M. P. Mashchenko, brigade leader for "Krashnoyarskgesstroy" were nominated in the competition for the USSR State Prize for 1979. Twenty-six workers in the industry bear the title of Laureate of the Lenin Young Communist League Prize.

Responsible tasks stand before the power workers in the concluding year of the Five-Year Plan. They will have to introduce 5-million kilowatts in new plants just at nuclear power plants, two such electrical power plants, the Smolenskaya and Yuzhno-Ukrainskaya, coming on line first. Preliminary operations are continuing for construction of the Zaporozhskaya AES rated at 6-million kilowatts. Construction of the Ignalinskaya AES is successfully underway in Lithuania where installation of 4 reactors rated at 1.5-million kilowatts each is planned.

The first power unit, rated at 800,000 kilowatts, will provide industrial power at the Ryazanskaya GRES. With the introduction of the fourth 500,00-kilowatt unit, the Reftinskaya GRES will reach rated capacity of 3.8-million kilowatts.

New heat and electric power stations will go into operation in Moscow, Leningrad, Barnaul and Tallin. By the way, it is necessary to say that the Soviet Union has long and securely held first place in the world in the area of combined production of heat and electrical energy at heat and electric power stations both in the rated output of the district heat producing plant units as well as by volumes of combined production of heat and electricity.

In hydraulic power, two new stations will go on line next year: the Cheboksarskaya GES on the Volga and the Kurpsayskaya in Kirgiziya. The second section of the Dnepr hydroelectric power station will reach rated capacity.

It will be required that the technical level of electricity production be increased significantly to insure the volume of production being planned. This may be achieved first of all by creating more powerful and economic boiler units, turbines, generators and other equipment. The search for engineering solutions permitting us to produce electricity by fundamentally new methods is no less important. Work in these directions is already underway today.

One of the most promising means for the direct conversion of thermal energy into electric power is the magneto-hydrodynamic method (MHD). The program for the creation of MHD generators which is being carried out in our country has significance for the future development of power engineering. There is already one such installation rated at 25,000 kilowatts. The construction of the first industrial MHD power unit, rated at 500,000 kilowatts, has been started in Ryazan'.

It is also necessary to mention such a promising trend as the use of superconductivity. Experiments are now being conducted with the aim of creating a superconducting cryogenic cable. The use of such cables for transmission of large amounts of electrical energy opens great possibilities. It is not difficult to imagine what large areas of land can be freed for the needs of agriculture and construction if overhead high voltage lines are replaced with this type of cable.

Proportion of Sectors of the National Economy
In the Use of Fuel
[converted to standard fuel, percentage]

Production of Electric and Thermal Energy	46%
Transport, Agriculture and Other Sectors	27%
Municipal and Everyday Services and the Population	11%
Other Needs of Industry	16%

Soviet electric power engineering is developing in close collaboration with the brother nations participating in the Council of Economic Mutual Assistance. Resolution of fuel and energy problems occupies one of the foremost positions in the plans of the socialist economic integration of the member states of the CEMA. Soviet power workers, true to their international obligation, are aiding in the growth of the energy base of these countries and sharing their rich experience.

Dozens of large electric power stations have already been built in socialist countries with the aid of the USSR. These are the Maritsa-Vostok and Varnenskiye heat and electric power stations and the nuclear plant "Kozloduy" and others in Bulgaria. The thermal stations "Tirbakh" and "Boksberg" in the GDR, and the "Nord" AES are under construction. In Czechoslovakia, the Yaslovske-Bogunitse nuclear power station, where the first unit is already in operation, is under construction. For their part, the countries of the CEMA are constantly increasing delivery of equipment, apparatus and instruments for power construction in the USSR.

Experience has shown the great advantages of the union of energy systems of the brother countries and the organization of their parallel operation. The Central Control Board of the Unified Electric Power Systems (UEPS) of the member countries of the CEMA has already been in operation for many years. These unified energy systems "Mir" just recently received powerful reinforcement. The Vinnitsa-Al'bertirsha (Hungary) electric transmission line, rated at 750,000 volts, which joined the UEPS "Mir" with the Unified Electric Power System of the USSR was submitted for operation.

The final year of the five-year plan, 1980, the year of the 110th commemoration of the birth of V. I. Lenin, is approaching. It is also significant by virtue of the fact that this will be the 60th year since the adoption of the Lenin plan for the State Committee for Electrification of Russia. Having broadly developed socialist competition, Soviet power workers are determined to fulfill the tasks placed before them in the coming year with honor.

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ELECTRIC POWER

ELECTRIC POWER GROWTH IN UKRAINIAN SSR

Moscow POD ZNAMENEM LENINIZMA in Russian 22 Nov 79 pp 42-44

[Article by A. Makukhin, UkrSSR Minister of Power Engineering and Electrification: "The Basis for Development of Industry"]

[Excerpts] Next year will be the 60th year since the adoption of the Lenin plan for the State Committee for the Electrification of Russia. The promising plan for electrification of the Soviet nation specified, in particular, the construction of 30 electric power stations with a total output of 1.75 million kilowatts over a ten-fifteen year period, including 560,000 kilowatts in the Ukraine. It is necessary to note that the plan was fulfilled ahead of schedule.

The words of V. I. Lenin about the fact that electrification is the most important of all of the tasks standing before us have not lost their urgency today. Due to the unflagging concern of the Communist Party and the Soviet State for satisfaction of the behests of Il'ich according to plan, electrification of our country is being realized rapidly.

UkrSSR Minister of Power Engineering and Electrification

Energy production scales have grown immeasurably: for all of 1921, 520-million kilowatt hours of electricity were produced in the country; today this amount is produced in 4 hours. Its annual production now exceeds one trillion kilowatt hours.

The Ukrainian SSR, having a powerful energy base and powerful enterprises for production of electric equipment, are making a large contribution to the development of the industry.

The glorious pages in the history of the development of power engineering in the republic began with the construction of an electric power station according to the Lenin Plan for the State Committee for Electrification of Russia. The Dnepr hydroelectric power station imeni V. I. Lenin, the first-born of Socialist industrialization, occupies a particular place in the chronicle of our Motherland. When presenting the Order of the October Revolution to the collective of construction management "Dneprostroy", members of the Politburo of the CPSU Central Committee, First Secretary of the Central Committee of the Ukrainian Communist Party, Comrade V. V. Shcherbitskiy said: "The Dnepr hydroelectric power station is dear to each Soviet man as a symbol of the youth of our state, as a personification of the labor heroism and the romance of the First Five-Year Plan."

Now the total capacity of the republic's electric power stations is 44-million kilowatts, i.e., it is equal to the rated capacity of 77 power stations such as the 1933 Dnepr station, and the annual electric power output exceeded 300-billion kilowatt hours.

The basis of the Ukraine's power engineering is large thermal-electric power stations equipped with modern, highly economical energy units with a unit output of up to 800,000 kilowatts. Of the 20 thermal electric power stations in the country rated at 2-million or more kilowatts, nine are within the Ukraine. As a component in the Unified Electric Power System of the USSR, the republic's electric power stations annually transmit 12 to 13-billion kilowatt hours of electricity to the central regions of the country.

In 1980 production of electric power should reach 251.6-billion kilowatt hours in the republic. The boundary is high. Therefore, the optimum concentration of the capacities of electric power units and electric power stations, improvement of the structure of generating plants based on their parameters and on switching possibilities, extending automation of production processes, the optimum expansion of combined production of thermal and electric power, the construction of powerful thermal and nuclear electric power stations, the development of high voltage electric transmission line networks, continuation of operations for formation of the associations for the republic's energy systems and improvement of planning and management are the basis for intense development of electric power engineering in the Ukraine in the 10th Five-Year Plan.

The accelerated development of nuclear power engineering is a new trend in the growth of energy capabilities of the republic. The 10th and subsequent five-year plans, the Chernobyl'skaya AES, the first in the Ukraine, with reactors with a unit capacity of one-million kilowatts each, has been commissioned and is successfully being made operational. During the year of the anniversary of the Plan for the State Committee for the Electrification of Russia, the Rovenskaya and Yuzhno-Ukrainskaya (AES) will be commissioned and construction of the Krymskaya, Khmel'nitskaya and Zaporozhskaya nuclear power stations is now being developed. Subsequently, plants will be commissioned just at AES for practical purposes. In 1980, for example, each third kilowatt hour of electric power will be produced at nuclear electric power plants.

The emphasis on construction of nuclear power plants is explained by the fact that they significantly outperform, let us say, thermal plants based on technical-economic indicators. Moreover, they pollute the environment considerably less and, as practice has shown, they are safe with regard to radiation.

If we take two stations of identical capacity, a TETs and an AES (one million kilowatts each), each of them is capable of producing 7.5-billion kilowatt hours of electric power per year. But 430,000 cars of coal will be required for operation of the thermal plant, whereas all of the fuel for the nuclear plant is contained in several cars. Operation of a one-million-kilowatt AES will free 2.3-million tons of conventional fuel for the national economy.

The republic's power workers and energy builders have great experience in construction of a continuous flow of large thermal electric power stations built at accelerated rates on the basis of an increase in industrialization and a sharp reduction of labor costs. Construction of the Burshtynskaya, Ladyzhinskaya and Zaporozhskaya GRES [State Regional Electric Power Station] is being accomplished by a high-speed flow-line method. Construction of the first of them was reduced by 12 months, and it was reduced by 2 years for the six 300,000-kilowatt power units of the Ladyzhinskaya power station.

The energy builders who are erecting nuclear power plants have the accumulated experience in the use of the highspeed flow-line method as a weapon.

In the 10th Five-Year Plan, the republic's energy industry, as is the case throughout the country as a whole, is rapidly developing. For (the first) 3.5 years, 6.1-million kilowatts of power capacity were introduced. Electric power production reached 762-billion kilowatt hours, which is 33 percent greater than for the corresponding period of the 9th Five-Year Plan. Fifteen-billion kilowatt hours of electric power have been produced just at the Chernobyl'skaya AES since the first reactor was put in service. Moreover, the relative savings of 7.35-million tons of coal with a heat value of 5,000 kilocalories has been achieved by the use of nuclear fuels.

The republic's power supply industry has received further developments in the 10th Five-Year Plan. The length of overhead electric transmission lines increased by 96,200 kilometres and their total length exceeded 800,000 kilometres.

Answering with deeds the high evaluation of their labors given in the greeting of Comrade L. I. Brezhnev, the builders and operations-specialists of the Zaporozhskaya and Uglegorskaya GRES assimilated highly economical power units rated at 800,000 kilowatts in a short period of time, permitting the structure of electric power production to be improved and a savings of 1.3-million tons of conventional fuel to be realized during the 3.5 years of the five-year plan.

The significance of these achievements in the careful use of fuel and energy resources is difficult to overestimate: the annual consumption of conventional fuel just at the thermal electric power stations of the UkrSSR Minenergo [Ministry of Power Engineering and Electrification] exceeded 73-million tons.

As a result of the broadly developed Socialist competition for conservation of fuel and energy resources, the republic's power workers have reduced the specific consumption of fuel per kilowatt hour of electric power produced by 7.1 grams, equal to a savings of 2.1-million tons of conventional fuel, during the 3 years of the 10th Five-Year Plan and during the eight months of 1979 this indicator constituted 76.7 thousand tons of conventional fuel.

The enterprises on the right flank of the industry have been awarded high governmental awards for high labor successes during the 10th Five-Year Plan. Senior Equipment Operator of the Kiev Unified TETs M. I. Kharitonov; I. P. Kutsenko, an electrical fitter at the Ladyzhinskaya GRES; and A. D. Salo, an electrician at the Poltavskoye electric-power distribution enterprise were awarded the Order of Lenin. In all, 802 leading workers in enterprises of the UkrSSR Minenergo have been awarded honors and medals of the USSR during the years of the 10th Five-Year Plan.

In winter as never before, all of the unused resources for improving reliability and economy of the equipment and all of the miscalculations and shortcomings which were committed become noticeable. Methods for use of special burners to heat the furnace bottom at the Tripol'skaya GRES for insuring high density heating at the electric power stations of Dneproenergo and for the use of full-discharge bunker installations for slime at the Kurakhovskaya GRES and others merit constant attention.

The fulfillment of decisions of the Party and the government for protection of the air basin and water sources in the regions in which electric power stations are located is an important trend in the work of the industry's workers. Much has already been done in this regard. During the three years of the Five-Year Plan, R 52.46-million have been acquired for construction on projects to protect nature, given a plan for R 51.02-million. About R 15-million has been allocated to these ends just in 1979, and the plan for eight months has been fulfilled by 123 percent. This has permitted us to reduce the amount of solid emissions into the atmosphere by 240,000 tons and convert a number of electric power stations to a closed circulating system of industrial water supply.

Preliminary operations to exclude waste water discharges into water supply sources completely during the 11th Five-Year Plan are underway.

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DONBASS POWER ADMINISTRATION PROJECTIONS

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNO-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 pp 7-8

[Excerpts from article by Yu.K. Semenov, general director of the Donbassenergo Power Generation Association: "Steps in the Power Engineering of the Donbass (1930-1980)"]

[Excerpt] About six percent of the unionwide output of electrical power will be generated at Donbassenergo [Donbass power system] power stations in 1979. The consumption of electrical power for internal needs will amount to 6.62 percent. Over one year, 15 million KWH of electrical power and more than 40,000 tons of conventional fuel will be saved above the plan.

The power system is realizing a commodity production of 870 million rubles in the current year. The power association income over the years of the 10th Five-Year Plan alone will amount to 800 million rubles (as compared to the ninth).

The specific number of electric power station industrial production personnel per megawatt of installed capacity has been reduced by 0.2 persons as compared to 1975.

In 1979, 88 percent of all of the generated electrical power will be obtained from units of 200, 300 and 800 MW.

Over a period of three years and nine months of the 10th Five-Year Plan, more than 7,600 km of power transmissions lines at all voltages have been placed in service, as well as 1.4 million KVA of transformer capacities, and 7,000 km of agricultural power transmission lines have been built.

Electric power consumption in agriculture will increase by a factor of 1.7 by 1980 as compared to 1970, and will amount to 1.8 billion KWH.

It is interesting to trace the dynamics of the change in the most important engineering economic indicator: the specific consumption of conventional fuel per KWH generated.

With the introduction of high power modern equipment into Donbass Power Engineering, about 11 million tons of conventional fuel were freed for the national economy through a reduction in the specific consumption of fuel from 450.2 g/KWH in 1960 down to 360.2 in 1980.

Such a result was also achieved through the implementation of more than 2 million measures in plans for new equipment with an economic impact of 35 million rubles, the use of 50,800 inventions and efficiency expert proposals in production with an economic impact of 37 million rubles, as well as the implementation of about 1,000 organizational and engineering measures at enterprises of the power system to save fuel and electrical power.

In the 10th Five-Year Plan, the enterprises of Donbassenergo are further reducing the downtimes of equipment for repair and extending the period between repairs for 300 MW power units up to four years, as well as implementing industrial plant methods of repair and spare parts fabrication.

Continual refinement of the economic management structure is characteristic of the Donbass, something which promotes the comprehensive development of its economy, as well as the more complete and efficient utilization of natural and labor resources. The territorial production complex of this region is distinguished not only by the considerable scales of production, but also by the exceptionally fast pace of development.

Capital investments in Donbass Power Engineering over the years of the last five-year plans are given in the table.

The rapid growth in power engineering capacities, and the complexity of power engineering equipment under the operational conditions of a production association require new methods of control and making economically justified decisions based on engineering, economic planning and all management activity.

Engineering is arriving here to assist the skilled personnel.

The first stage of the Donbassenergo automated control system (ASU) was placed in service in the power association in December of 1974.

In December of 1978, the state commission accepted the first stage of the automated dispatcher control system (ASDU).

There are now 28 computers in service in the "Donbassenergo" PEO.

The assignment set in the 11th Five-Year Plan is the equipping of all technological services of the association with cathode ray tubes for the capability of feeding data into a computer and obtaining the

Capital Investments, Millions of rubles	Years 1965-1970	1971-1975	1976-1980
Overal	326	716	466
Including:			
For social and domestic services	29	42	33
For environmental protection measures	9	49	35

requisite data from it for making decisions, as well as to continue the work on the design of the second stage of the ASDU.

Accounting has been mechanized in the association. Practically each large association of the power system has its own computer facilities and mechanizes the basic accounting work with them.

The engineering policy of the association today is to concentrate these facilities in unified centers (reference points) for the capability of servicing groups of power system enterprises.

The creation of six such reference points is planned by 1982 (in the following cities: Donetsk, Voroshilovgrad, Severodonetsk, Slavyansk, Gorlovka and the Zuyevskaya GRES). In this case, the problem of the comprehensive mechanization of the accounting operations will be solved for all of the enterprises of the association.

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ORGANIZATION OF SLURRY BURNING AT KURAKHOVSKAYA GRES

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNA-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 pp 14-15

[Article by V.A. Dubovnik, N.P. D'yachenko, V.N. Yerisov and V.A. Luchnikov, engineers]

[Text] The problem of burning slurries is one of the most important in power engineering because of the increasing use of low grade fuels.

The first, and one of the greatest difficulties with the mass delivery of slurry is its unloading and transportation.

The high moisture content of this fuel is the reason for the clogging of the receiving devices and the smearing of the grates of the fuel feed channel. To improve the flow of slurry through the station channel, receiving bunkers with shaking feeders were installed, which had proved themselves well in service. The reciprocating motion of the feeder table promotes the sliding of the adhering coal from the walls and its pushing through on the belt conveyor.

One of the ways of improving the free flowing properties of slurry in the case of bulk delivery is layering it with other grades of coal, i.e., careful intermixing. This work, despite the volume of it and the large labor outlays, is justifying itself and is essential, since the possibility of sealing and dome formation is reduced in the receiving tanks of the fuel transport and boiler shops.

However, the implementation of this measure requires the presence of additional areas in the fuel transport shop, as well as increasing the number of bulldozers.

Good results were obtained at the Kurakhovskaya GRES using a rotary loader (RPM) for the layering. In this case, the result is equivalent to agitating the fuel twice. The first is when the coal is fed by the bulldozer to the RPM, and the second, by the RPM itself.

A thawing shed was retrofitted to provide for unloading of the cars with the frozen-together fuel during the winter period.

The warming of the cars in the thawing shed was provided in the project plan using only hot air. The main drawback to the plan solution was the local heating of the cars. The installation of steam shroud heater along the side walls of the entire thawing shed was proposed by the "Soyuztekhenergo" Production Association. Following their installation, the efficiency in the heating the cars increased significantly.

The difficulties considered here apply primarily to fuels with a moisture content of 12 percent and above. When fuel comes in with a moisture content of down to 12 percent, it is more expedient to feed it directly from the car tipper via the belt conveyor to the boiler shop, because of which, the gratings were installed beneath the car tipper on springs, they were provided with vibrators and the size of their mesh was increased.

The next important is the elimination of the nonoperability of the BSU-PSU channel: the input throat of the pulverizer. Since the first 200 MW unit was placed on line in the winter period, the defects in this assembly did not delay their impact on the load carrying reliability, something which required their immediate elimination. According to the project plan, the raw coal bunker was equipped with four chutes with a rectangular cross-section of 200 x 800 mm, through which the fuel is fed to two scraper type raw coal feeders.

The unsuccessful configuration of the lower portion of the bunker and the inadequate size of the chutes in the area of the output openings were the cause of constant dome formation. Mechanical cleaning of the bunkers did not yield the desired results. Based on the recommendations of the Urals Branch of the All-Union Thermal Engineering Institute, this assembly was rebuilt. The essence of the rebuilding consisted in changing the configuration of the lower portion of the bunker, replacing the four chutes with two, and then using one large diameter circular cross-section and making a transition to belt feeders with a belt width of 2,000 mm and a layer height on the belt of 400-800 mm. The productivity of the PSU is adjusted by changing the rotational speed of a direct current motor.

Subsequent operational experience showed that this rebuilding was a successful solution for the conditions for the Kurakhovskaya GRES, which at times burns coal with a moisture content close to the maximum (30-32 percent).

To clean the input throats of the pulverizers which are frequently clogged with slurry, a circuit is used for flushing them with high pressure water. This has made it possible to partially solve the problem, curtailing the time expended for the cleaning, but has not completely eliminated the clogging of the throat by slurry.

Besides assurring the passability of slurry through the fuel feed channel, considerable difficulties faced the station as regards increasing the productivity of the dust systems, since the actual characteristics of the coals delivered to the GRES differed sharply from the planned characteristics.

Calculations show that the pulverizing capacity of the pulverizer throughout the entire range of moisture contents of the incoming slurries falls in a range of 65-85 t/hr, i.e., 170 t/hr per block; the drying capacity falls off sharply with an increase in the moisture content of the fuel. For an average slurry moisture content of 24-26 percent and a suction coefficient for cold air into the dust system of $K_{pr.s} = 0.4$, the drying capacity falls off to 41-37 t/hr. When $K_{pr.s} = 0.2$, the capacity amounts to 49-45 t/hr; the fuel consumption per boiler for the case of an ash content of 43-44 percent amounts to 198-210 t/hr, and the humidity in this case is taken as 24-26 percent.

It is obvious from these data that the capacity of the dust systems is inadequate to assure the nominal capacity of the unit.

A series of measures were tried at the GRES, directed towards increasing the drying capacity of the dust preparation installations: sealing the dust system channels, installing circuits for supplying additional hot air to the pulverizers via lines of slightly heated air, etc. However, the drying capacity remains insufficient.

The complex of measures performed both for the fuel transport and the boiler equipment have made it possible to significantly increase the capabilities of the station to receive, process and burn low grade fuel. During 1977, 549,000 tons of coal slurries were burned at the GRES, and in 1978, this figure was 967,000 tons.

At the present time, the collective of the station is continuing work on the solution of the problem of burning slurries in large quantities.

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RELIABILITY AND ECONOMY OF TPP-312A STEAM GENERATORS

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNO-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 pp 16-18

[Article by V.V. Litovkin, engineer]

[Text] An individual pulverized fuel preparation system with a pulverized coal bunker, two ball drum pulverizers ShVM 370-850, for GSSh [gas coal, 'seed with dust'] and GK [large gas coal] coals with an output of up to 105 t/hr was adopted in the project plan for the TPP-312A boiler.

A series of project plan solutions, which copy the pulverized coal system operating on ASh [culm anthracite (piece size 3-0 mm)], called for the implementation of a series of comprehensive measures during 1974-1978, which assure reliable operation of a 300 MW unit when burning high ash content gas coals of different brands: GR [rough gas coal], DR and DMSSh [not further defined]. The study, setting up for and organizing the operation was directed towards refining the furnace process, improving the operation of the KVO [not further defined], modernizing the burners, the heating surfaces and other equipment.

In the process of debugging the equipment of the Uglegorskaya GRES, the TsKTI [the central scientific research and project planning and design institute for boilers and turbines imeni I.I. Polzunov] and the TKZ [Taganrog boiler plant] studied a new configuration for the injection of excess drying agent into the furnace, which made it possible to resolve the questions of pulverized coal system ventilation and furnace chamber operation. Positive operational experience was obtained with high power turbulet type burners with a heat capacity of 100 MW (a productivity of about 20 t/hr where Q^{p}_{H} = 21 MJoule/kg). Based on a complex of works performed by the station in cooperation with the TKZ, TsKTI, VTI [All-Union Order of the Red Banner of Labor Heat Engineering Institute imeni F.E. Dzerzhinskiy] and Dontekhenergo, positive operational experience was obtained which was taken as the basis in the project planning for the boiler equipment of the Zuyevskaya GRES-2, designed for burning even higher ash content coals. Operational experience with the TPP-312A

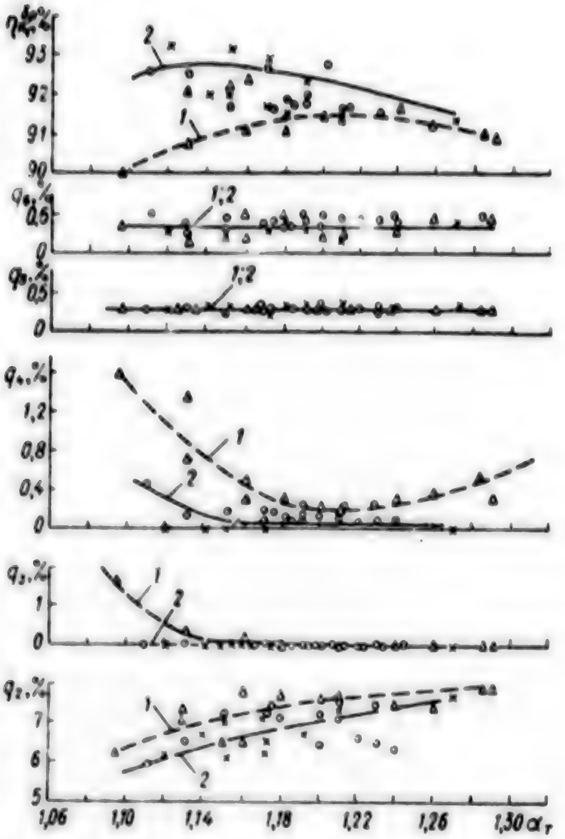

Figure. Curves for the change in the operating economy indicators of the TPP-312A boiler plant when excess drying agent is fed into the furnace through special nozzles (1) and through a central channel of the main burners (2).

Key: 1. Data of the ORGRES [State Trust for the Organization and Efficiency Improvement of District Power Stations and Networks], Zaporozhskaya GRES where D_k = 840 - 870 t/hr; $t_{p.k}$ = 925° C to 1,117°C; R_{90} = 26 - 28%;

2. Data of the TsKTI [Central Scientific Research, Project Planning and Design Institute for Boilers and Turbines imeni I.I. Polzunov] and the UGRES [not further defined] where D_k = = 814 - 955 t/hr, $t_{p.k}$ = 814 - 955° C [sic]; R_{90} = 22 - 30%.

Δ = Trials at the Zaporozhskaya GRES;
O = Trials at the Uglegorskaya GRES;
X = Trials at the UGRES — TsKTI (1976).

steam generators has promoted an intensification of work to study the fuel preparation and pulverized coal preparation systems, as well as refine the GZU [not further defined] system. In the process of mastering the combustion of low grade fuels for high power units, clear-cut operational requirements were worked out for a number of assemblies which determine the high readiness of a unit for carrying an electrical load.

The continuous slag removal system with twin screws should provide for rapid removal of the slag following the night dip in the load. It is possible to use the ash pulp out from under the electrostatic precipitation filters for granulation purposes. The use of wear resistant solid alloy nozzle components assures a constant balance of water in accordance with the output capacity of the dredger pump rooms.

Maximum boiler efficiency of the TPP-312A is achieved when using straight through-turbulent type burners designed by the TKZ, TsKTI and Uglegorskaya GRES.

The combustion of fuels with an ash content of $A^P \geqq 30$ percent requires the systematic cleaning of the furnace shields.

Pulsed methods of cleaning through nozzles by means of steam are effective for cleaning a rotating gas duct and RVP [not further defined].

For the TES [thermal electric power station] layouts which have come into use with an industrial pulverized coal bunker, reducing the size of the fluctuations in the excesses of air in the furnace due to the variation in the bulk effeciency of the pulverized coal feeder, and the heat of combustion, is possible when using automated systems for stabilizing the control of fuel consumption, something which permits an increase in the thermal load of a furnace by 7 - 10 percent. In the technical specifications for the delivery of steam generators with burners having a thermal capacity of 100 MW and more, the requirements for automatic fuel consumption stabilization should be included.

To master the combustion of low grade gas coals at the newly planned electric power stations, it is necessary for the KVO to be selected by working from the worst case quality characteristics of the fuels of the suppliers. For the GR, DR and DMSSh coals of the Donetsk basin, these indicators are $A^P \geqq 40 - 50$ percent and $W^P \leqq 25$ percent.

It is not expedient to design semi-open pulverized coal systems for the combustion of high ash gas coals. The fuel preparation of gas coals in the ShMB 370/850 pulverized coal system reduces the flexibility of 300 MW units and leads to an increase in the specific fuel consumptions at low loads of 10 to 15 g/KWH.

The operation of the 300 MW monoblock series pulverized coal preparation systems with the TPP-312 and 312A boilers is closely tied to the operation of the furnace chamber, since the dust is transported by a waste pulverizing agent. Unsatisfactory experience with the operation of such a configuration was obtained as early as 1963 at the Starobeshevskaya GRES, however, false engineering economic substantiation of this configuration, without considering the prospects for fuel supply, was repeated. Only the high reactivity of gas coal made it possible to find optimal operational modes of the furnace. Dust transport by hot air with O_2 = = 21 percent would allow for an improvement in the flexibility characteristics of the TPP-312A steam generator, especially with loads of 0.5 times the nominal and less.

The reduction of the level of NO_x nitrogen oxide emissions in steady-state and variable operating modes can be accomplished by recirculating part of the gases (for the TPP-312, the excess drying agent) through center channels of the burners. The attainable level of NO_x emissions is 0.065 to 0.9 g/m^3 for the case of a nitrogen content in the fuel of N_p = 1.2 - 1.7 percent.

The EGZ electrostatic precipitation filters do not assure the planned level of gas cleaning during long term operation. Over a short period of operation, a cleaning level of 99.2 percent was achieved. To boost the operational cleaning of the gases from 97 - 98 percent up to 99 percent, it is necessary to modernize the system of coronizing electrodes and to separate the jolting mechanisms in the half-field system, something which increases the efficiency by 6 to 7 percent as compared to the level of reduction in the cleaning level when the high voltage is removed from one field due to short circuits for breakage of jolting mechanism shafts.

To assure a service life of up to five years for the RVP-98 packing in 300 MW units, it is necessary to use heaters to heat the air up to 70° C, something which guarantees a service period between flushing of up to three months. In the case of tight slide valves, the flushing of RVP during its travel is effective.

Different structural designs of the shields, and the burners with thermal capacities of 50 MW and 100 MW with differing degrees of twisting of the air mixture were successfully tested for the first time in one station with identical dimensions of the furnace chamber.

Operational experience recommends high power burners with a thermal capacity of 100 MW and more for the combustion of high ash content coals; vertical shields should replace horizontal ones; vertical slots for the injection of the recirculating gases; a thinned-out bundle of convective heating surfaces following the passage of the gases through the horizontal gas duct; slag removing devices for the peak slag rate; and a variable direct current drive for the screw conveyor of GZU, RVP, PSU [not further defined].

The majority of these PRO recommendations of "Donbassenergo" were realised in the project plan for the Zuyevskaya GRES-2, which will be implemented in the future.

Seven years of experience with the operation of TPP-312A steam generators has confirmed the good operation of the boiler NRCh [not further defined]. The gas corrosion process in some furnaces of TPP-312 and 312A boilers when they have operated for less than 35,000 hours was related to the nature of gas formation in the furnace chamber. When α_t = 1.15 - 1.18, after 40,000 hours of operation, the heating surfaces of the boilers of the Uglegorskaya GRES were in satisfactory condition and not damaged by gas corrosion where SP = 1.2 - 4.8 percent.

The steam generator reliability is considerably greater than the KVO reliability. In 1978, more than 1,600 forced shutdowns were necessary for the eight ShBM 370/850 pulverizers with the complete pulverizing system equipment package, while there were no more than 22 failures of the boilers. The Uglegorskaya GRES has undertaken a program of modernization of the dust systems of the 300 MW units, which include the replacement of the MV 180/1100 by the quiet running VM-26 machine, the rebuilding of the coal dust ducts up to the burners and within the limits of the burner; an improvement in the efficiency of the cyclone dust separators of 0.5 percent, based on TsKTI recommendations, and other measures.

During 1976-1978, the Uglegorskaya GRES placed rapid wear components made of tungsten-free hard alloys of the TN type in service, where these operate in an abrasive water medium. The nozzles of the system were rebuilt: the GZU, the injectors, the Laval nozzle for flushing devices with steam, and flushing the RVP with high pressure jets. The work which was performed improved the operation of the nozzles in the GZU channels, and the quality of the cleaning of the RVP-98. The use of nozzles made of the TN alloy for the injectors improved the operating mode of the boiler on the fuel oil with loads of 80 - 100 MW.

Data are shown in the Figure which make it possible to estimate the technical economic indicators of the TPP-312A boilers.

The boilers operate most economically at α_t = 1.15 (α_r = 1.05 - 1.1). For reliable support of boiler operation with such excesses of air, it is necessary to provide for a stable coal dust feed and to eliminate uncontrolled fluctuations in the coal dust bunker—dust feeder system. During the operation of TPP-312A steam generators, the attainable growth efficiency is 92.8 - 93 percent, a figure 2 percent above the design value. Increasing the ash content of the fuel above the design value by more than 5 percent also leads to a reduction in the average load during long term service down to 0.9 N_{nom}.

Cutting off one or two burners of a TPP-312A steam generator does not reduce the ignition stability and does not lead to disruptions of the temperature mode in the furnace. Long term operational experience with TPP-312A steam generators when burning a mixture of various fuels from gas concentrates to slurries with $A^c \leq 63$ percent confirms the possibility of increasing the per unit thermal capacity of the burners above 100 MW.

When running on coals which are close in terms of their qualitative characteristics to the design characteristics, stable output of liquid slag can be retained up to loads of 140 MW without flare lighting from below by the fuel oil. The problems of mastering the burning of batches of high ash content coals with $A^p \geq 30$ percent and more, require that ways of cleaning the shields of furnace with water be worked out in the near future, something which will make it possible to increase the utilization of the installed capacity of 300 MW units when burning large batches of different brands of ballast coals. Further refinement of the boiler equipment of the 300 MW units is possible in the future by means of providing for the furnace process being independent of the operational mode of the pulverized coal system, something which can be realized by means of an open coal dust system. The expediency of large scale reconstruction operations will be determined by the fuel balance in the European portion of the USSR.

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EXPERIENCE WITH ASH CATCHERS AT THE VOROSHILOVGRAD GRES

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNO-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 pp 20-21

[Article by V.Z. Korol', engineer]

[Text] The increase in thermal power engineering capacities, as well as the growth in public health requirements placed on atmospheric air purity, are complicating the problem of protecting the air basin against volatile ash emissions.

Some three kinds of ash catchers have been installed at the Voroshilovgrad GRES: the MP-VTI and "Uraltekhenergo" wet bar type, on the TP-230B boilers, the "Uraltekhenergo" ash catchers and PGD 4x30 electrostatic filters on the TP-100 (or TP-100A) boilers. The station has carried out a set of operations to improve their efficiency.

Increasing the efficiency of "wet" ash catchers is accomplished by means of rebuilding them, installing Venturi coagulators ahead of the catchers, where particles of ash are trapped by water droplets in the coagulators with the action of inertial forces.

The major parameters which characterize the ash catching efficiency are the specific consumption of water to irrigate the Venturi tubes and the gas flow rate in the throat.

Based on the data of "Uraltekenergo", for a specific mass rate of flow of the water of 0.1 - 0.2 kg/m^3 and a gas flow rate in the throat of 45 - 80 m/s, the efficiency of the ash catchers amounts to 94 - 98 percent respectively. Since it would be necessary to reduce the diameter of the coagulator throat down to values at which the resistance of the installation increases impermissibly to increase the rate of flow of smokestack gases up to the upper limit, the actual velocities of the smokestack gases do not exceed 55 - 60 m/sec in the throats of the ash catcher coagulators. In this case, the efficiency of the installations amounts to 94 - 96 percent. The MP-VTI have four trap regions (1, 2, 3, 4) (see the Figure).

The ash is trapped in the first region by drops of vaporized water; in the second, it is precipitated on irrigated rods of a grating and on drops torn away from the gratings by the flow of gases; in the third, further trapping of the ash is achieved by water droplets; and in the fourth, the particles are precipitated on the internal surface of the ash catcher housing.

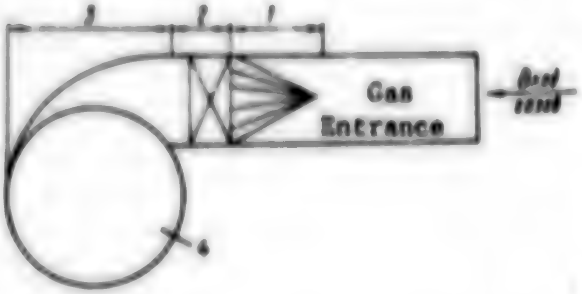

Figure. Ash catching regions in the MP-VTI units.

The ash cleaning coefficient of the gases in the first region is at a level of six percent; in the second, it depends on the ractional composition of the ash and amounts to: for particles of 60 m, 100 percent; 40 - 60 m, 99,9 percent; 30 - 40 m, 99.2 percent; 20 - 30 m, 94.1 percent; 15 - 20 m, 77.2 percent; [illegible] -115 m, 54.4 percent and 0 - 5 m, 51 percent. The ash trapping efficiency in the third region is η_3 = 5 - 6 percent. In the fourth region, the efficiency η_4 depends on the diameter of the drop catcher and amounts to about 20 percent.

In the case of the typical fractional composition of the ash of the solid fuel burned under the station boilers (0 - 10 m, 21 percent; 10 - 20 m, 20 percent; 20 - 30 m, 17 percent; and 30 - 40 m, 10 percent), the efficiency of scrubber gratings reaches 80 percent, while the efficiency of the installation reaches 90 - 91 percent.

Thus, the "Uraltekhenergo" ash catchers have undisputed advantages over the MP-VTI ash catchers. The modernization of all wet catchers with the installation of Venturi coagulators ahead of the catchers will be completed in the near future at the Voroshilovgrad GRES. The water feed for the irrigation of the coagulators and their technical condition are being constantly monitored to maintain the indicated level of efficiency of the wet ash catchers, and periodic checks of the ash catching efficiency are also being carried out.

The efficiency of the "Uraltekhenergo" also depends in many respects on the quality of their fabrication and installation. The basic conditions are: conformity of the geometric dimensions of the metal portion of the coagulator to the design figures; the performance of refractory lining work at an air temperature of no less than 10° C; the conformity of the refractory lining material to the technical specifications; the thickness of the seams and the height of the offsets between the spacing plates of one row, as well as between the plates of adjacent rows should not exceed the established quantities; the drying of the refractory liners for three to four days at an air temperature of 35 - 40° C.

The type PGD 4x50 obsolete design electrostatic filters installed on four units, are to be replaced by new type PGD (UG) 4x50 in accordance with the directive instructions of the USSR Ministry of Energy.

This modernization was carried out in accordance with the "Giprogazoochistka" project plan in August - November of 1978 on one of the units. In this case, the active cross-section area was increased, as well as the precipitation area of the coronizing and precipitating electrodes, the corona current was boosted by installing needle type corona electrodes, and improved type AGF-400 and AGF-600 units were installed.

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OPERATIONAL EXPERIENCE WITH 750 KV ELECTRIC POWER TRANSMISSION EQUIPMENT

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNO-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 pp 29-31

[Article by S.I. Ostapenko and I.V. Pushnoy, engineers]

[Text] The Donbass--Western Ukraine--Hungary (Al'bertirsha) alternating current 750 KV industrial electric power transmission system, which is the first in the Soviet Union, is the first step in the creation of a 750 KV network in the power systems of the Ukraine.

The power transmission system was designed by the Ukrainian branch of the "Energoset'proyekt" institute.

The "Yuzhelektroset'stroy" and "Elektroyuzhmontazh" trusts participated in its construction, and the alignment work was handled by Dontekhenergo, Yuzhtekhenergo, Sibtekhenergo, Soyuztekhenergo and the installation and alignment administration of the "Elektroyuzhmontazh" trust.

The 750 KV Open Wire Line. The 750 KV line was built using metal galvanized supports of both the regular and elevated types, as well as a portal type with guys.

Some four ASU-400 wires were installed in each phase of the line, where these wires were arranged on the sides of a square with sides of 600 mm. The suspension insulator strings of the line were composed of PS-12 and PS-22 insulators, and each string was secured to the crossarm of a support separately.

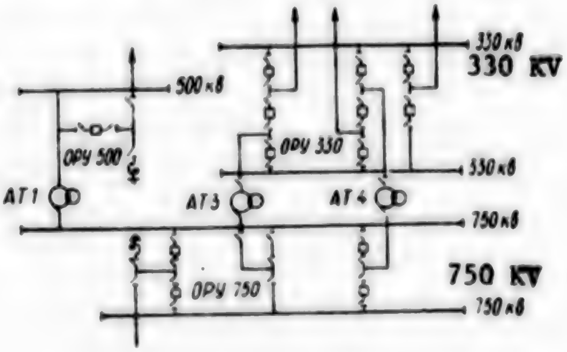
The insulators used on the line have a small rejection percentage during installation, and also make it possible to dispense with labor intensive operational work when checking the insulation.

Lightning protection of the line against direct lightning strikes was accomplished by means of two ASUS type cables, strung along the entire length of the line with a protection angle of 20-25°.

To protect the cables against "dancing" with icing, a provision is made for melting the ice on them with 110 KV from a specially installed TDTN-80000/110 transformer.

The location of faults in the line is accomplished by means of automatic oscilloscopes which record the prebreakdown mode, as well as recording instruments. To precisely specify the location of a fault and curtail the time for eliminating faults on a line, the 750 KV "Donbasskaya" substation is equipped with pulse fault finders.

The "Donbasskaya" 750 KV Substation. Some three groups of single phase autotransformers with an overall capacity of 3.25 million KV are installed at the substation at the present time, and in the future, their capacity will amount to 4.5 million KVA. The open bus-and-switch structures of the substation will be designed in a one-and-a-half circuit configuration (three switches per two connections) using VNV series switches. The existing single line circuit of the substation is shown in the figure. The circuit is reliable in various operational modes and convenient in operation.



The "Donbasskaya" 750 KV Substation:

Key: AT-1. 1,250,000 MVA autotransformer, 750/500 KV;
AT-3.-- AT-4. 1,000,000 MVA autotransformer, 750/330 KV, 500, 750 KV;
OPY 500. 500 KV bus-and-switch structure;
OPY 750. 750 KV open bus-and-switch structure.

The structural portion of the substation was made of prefabricated reinforced concrete and galvanized metal structures.

Hollow AP-500 conductors with two and three conductors per phase were used for the buswork of the substation equipment.

All of the hanging insulation of the substation was made of double strings of 40 - 42 glass insulators each per string having separate fastening of each string to the crossarms of the portals.

The open bus-and-switch structure of the substation was equipped with permanent biological protection devices for the personnel, which reduced the electrical field intensity at the work sites down to the safe level of 5 KV/m.

Power Transformers. Domestically produced AODTsTN-417000/750-500-73U1, AODTsTN-333000/750-330 and ODTsTNP-92000/150 (transverse regulation) autotransformers were installed at the substation.

The autotransformers are equipped with an outboard cooling system with forced oil circulation, and fans with a reduced r.p.m. are used in the coolers.

The hermetically sealed entrances of the autotransformers are under constant excess oil pressure and equipped with devices for automatically monitoring the condition of the insulation.

The transformer oil is protected against the action of the atmosphere by film and nitrogent protection.

The gases dissolved in the transformer oil are periodically analyzed by a gas chromatograph for the diagnosis of developing faults in the insulation of the transformers.

All of the autotransformers are equipped with automatic water-foam fire extinguishing and automatic relief and cutoff valves.

Reactors. To compensate for the charging capacity of the 750 and 500 KV lines, RODTs-110000/750 and RODTs-60000/500 shunting reactors with a ferromagnetic shield which envelopes the winding of the reactors from the outside are in service at the substation. Hermetically sealed entrances of a special design made of nonmagnetic materials are installed on the reactors.

Open Air Switches. Support type VNV-750-3200-40U1 switches are used to perform the operations of connecting and disconnecting equipment, where these switches are of a modular design with a single level horizontal configuration of the modules, having a working air pressure of 40 kg/cm^2 and an inherent disconnect time of 0.025 sec.

In terms of their technical characteristics and structural design, the indicated switches are more refined than those employed previously (operational speed, high disconnect capability, simplicity of design, and simplicity of the transition to a higher voltage class). A substantial drawback to them is the poor quality of the sheathing rubber of the valve.

Disconnectors. RNVZ-750/4000 type disconnectors with vertical rotation of the knives are used at the substation. During operation, a series of structural steps were taken with the disconnectors to prevent breaking the insulators of the rotating columns, breaking the compensation springs and misadjustment of individual poles.

Dischargers. To protect the custom-made equipment against atmospheric and switching overvoltages, RVMK-750M, RVMK-500 and RVMT-500 type dischargers are used, which have improved voltampere characteristics.

Voltage Transformers. Capacitive type NDYe-750 voltage transformers were used for the first time to supply the measurement and repair protection circuits at the substaiton, where these transformers simultaneously provide for a reduction of the switching overvoltages across the contacts of the switches in the APV line cycle.

Current Transformers. A system of continuously monitoring the insulation of all type TRN-330-750 current transformers at the working voltage, with the recording of the sum of the capacitive currents of each three-phase group was placed in service and mastered at the substation, beginning in 1976, something which makes it possible to actively evaluate the state of the insulation characteristics of the units.

Relay Protection. Differential phase high frequency protection using DFZ-503 semiconductors and remote protection using DZ-503's are used as the main protection for the line.

Emergency automation devices are widely used at the substation, where these inhibit the occurrence of asynchronous operation, throwing-on the power, a boost in the voltage, etc. Remote load relief automation with pulsed disconnect is used, where the information is transmitted via the electrical power lines over considerable distances in a few milliseconds.

The power autotransformers are protected by DZT-21 differential semiconductor protection and RG-43-66 gas relays.

The protection and automation devices enumerated here provide for reliable operation of the 750 KV electric power transmission system under both normal and emergency conditions.

Communications. The primary means of dispatcher and production process control on the 750 KV substation line are high frequency remote control and communications channels, as well as operational line UHF radio service, which make it possible to conduct any conversations with the line crews, other facilities, as well as transmit a large volume of remote information to the UDP [not further defined] and the ODU [centralized dispatcher control administration] of the South.

The experience acquired with the operation of this custom made equipment of the substation makes it possible to draw a few conclusions: the equipment installed at the substation basically conforms to the requirements placed on it, taking into account the elimination of defects, ascertained during operation; to assure operational reliability of the equipment, it is necessary to have back-up equipment at the substation (including standby phases of the autotransformers and reactors); to diagnose developing faults in the equipment, it is necessary to perform further scientific research work to design gear for continuously monitoring the condition of the equipment.

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RESULTS OF TRIAL OPERATION OF 800 KV CONVERSION SUBSTATION

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNO-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 pp 31-33

[Article by Ye.A. Krasnopol'skiy and N.F. Maksimenko, engineers]

[Text] The Volgograd--Donbass 800 KV direct current power transmission system was designed as an experimental industrial one, intended for linking the South power systems of the European portion of the Soviet Union with the Center power systems.

The transmission system was built as a scientific production base for an industrial check of new designs in the field of high power direct current electrical power transmission systems with asynchronous inserts between the power associations.

The power transmission system was placed in service in 1962, and its construction was completely finished in 1965 [1].

The main equipment of the Mikhaylovskaya conversion substation is eight conversion bridges (Figure 1) [not reproduced]. Each of them is equipped with 14 single plate mercury vapor rectifiers with a rectified current of 900 amps, with a plate voltage of 130 KV. The converter bridges (for a voltage of 100 KV each) are connected in a cascade series of four bridges each, forming the two poles of the converter of the substation.

Each of the two poles of the converter substation are connected through a line reactor to half of the line circuit for the 800 KV power transmission system.

The insulation of a pole of the converter and a power transmission line half circuit is designed for a working voltage of ± 400 KV with respect to ground and a voltage of 800 KV between the poles and the half circuits.

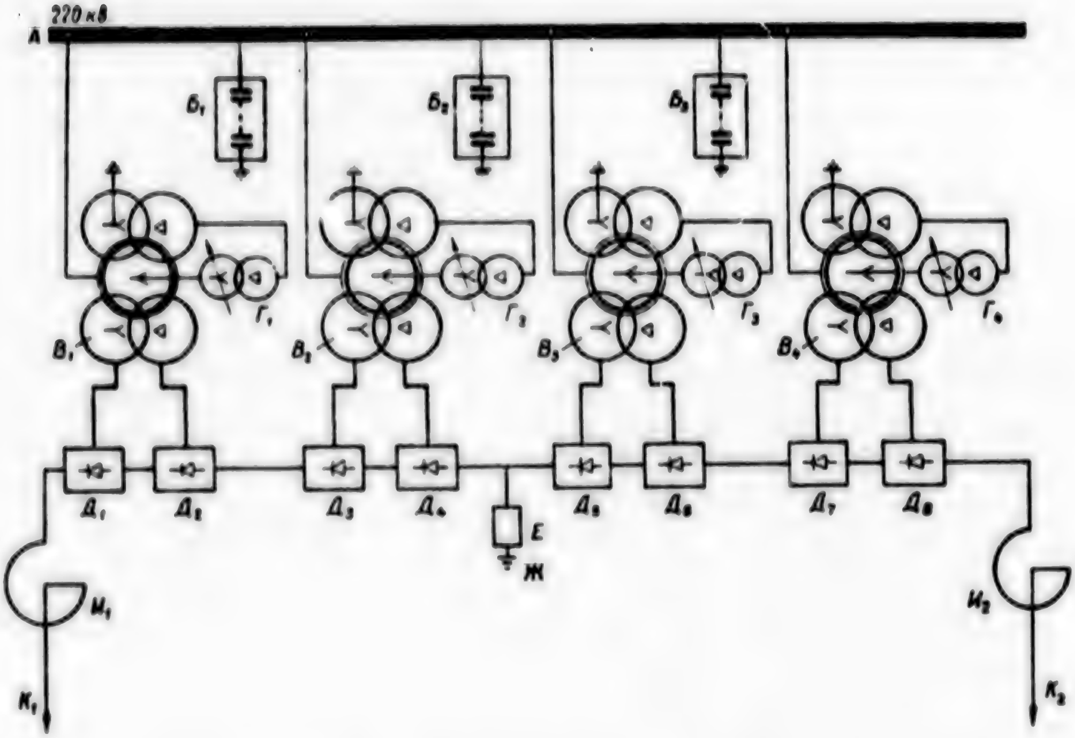

Figure 2. Basic schematic of the Mikhaylovskaya converter substation.

Key: А. The 220 KV bus systems;
$Б_1 - Б_3$. 220 KV shunt capacitor banks with a capacity of about 600 MVAR;
$В_1 - В_4$. The 3xODTTsR-90000/220-400 main transformers;
$Г_1 - Г_4$. The VRTD NU-270000/35/15 voltage boost transformers;
$Д_1 - Д_8$. 100 KV, 900 amp converter bridges;
Е. Center tap distribution device;
Ж. Outboard working ground for the center tap;
$И_1 - И_2$. Line reactors;
$Н_1 - Н_2$. Direct current, 800 KV power transmission line to Volgograd.

There are three shunt capacitor banks at a voltage of 220 KV with an overall capacity of 580 MVAR, which were placed in service in 1968, 1970 and 1971, to compensate for the reactive power consumed by the converter at the substation.

The basic schematic of the converter substation is shown in Figure 2.

Both poles of the converter substation have a common center tap, which is connected to the working ground by a remote working ground line with 110 KV class insulation, where the line is 32 km long.

The power transmission line, 473 km long, was erected using T-shaped metal supports. The complex supports are of the portal type. The wire is 2 x ASO-600. The area of ground set aside underneath the lines supports is approximately an order of magnitude less than set aside for 500 KV lines. Both lines are shown in Figure 3.

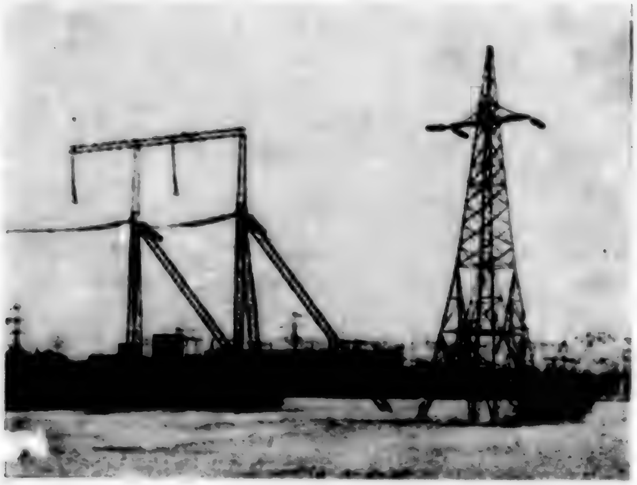

Figure 3. The 800 KV direct current power transmission line and the outboard working ground line.

The Operation of the Power Transmission System.

In 1965, the direct current power transmission system was checked by simultaneously switching all eight converter bridges on, and in this case, the nominal working voltage of 800 KV was fed into the line for the first time. It was tested in 1967 at the full design capacity of 720 MW.

Since 1973, the average power transmission load has exceeded 200 MW, while the mean annual mnumber of surface hours over this period reached 7,000.

In the process of operating the Mikhaylovskaya converter substation, the overvoltage protection was improved, as well as the control, protection and regulation devices [2].

At the present time, the condition of the equipment of the converter substation provides for a power overcurrent of up to 400 MW at a current of up to 700 amps. The indicated reduction in the carrying capacity as opposed to the design parameters (720 MW) is explained by the poor operational reliability of the mercury vapor rectifiers and the shunting sets.

Mercury vapor rectifiers (RV) are the main equipment of the converter bridges. Structural design changes in the rectifiers and operational and technological measures were carried out during the entire period of mastering the operation of the converter substation [2], as a result of which their mean service life increased from 10,000 hours in 1975 up to 20,000 hours in 1979. The mean time before failure of the RV's doubled.

The major reasons for the failures of the RV's are the breakdown of the insulation and the extinguishing of the lower excitation level.

Because of the development of high voltage thyristor units (VTB), the production of mercury vapor rectifiers and spare parts for them was terminated in 1979. The retrofitting of the power transmission system, replacing the mercry vapor rectifiers by VTB's is planned, for which no less than five years is required. An increase in the failure rate of the mercry vapor rectifiers is to be anticipated in this period, since their further aging can lead to a significant reduction in the electrical strength.

The shunting units (AShVN) were designed for either automatically or operationally taking the bridge out of service. These units, designed around the type VVN phase switch with a knife separator have poor operational reliability. Even with a periodicity of planned repairs of the AShVN of two years, the average annual duration of emergency repairs exceeds the duration of planned repairs by more than four times. The situation is made even worse by the fact that the failure of the AShVN of only one converter bridge, as a rule, causes the entire the half circuit in which the corresponding bridge is inserted to fail.

The collective of the Sergovskaya PES [not further defined] has designed a new shunting unit around the pole of an air-filled 110 KV switch, the quenching chamber of which was rebuilt as an arc chamber, and the circuit for connecting the unit to the converter bridges have also been refined for the purpose of repairing the shunting units without disconnecting the entire half-circuit.

Over a year of operation, the trial unit performed 110 switchings in placing the converter bridge in service, without requiring repair.

Stable asynchronous coupling has been achieved in the operation of the power transmission system, and its load flexibility and mobility during overcurrent regulation has confirmed. The control of the level and direction of the transmitted power is achieved operationally regardless of the voltage levels across the converter substations.

The power transmission system has passed an operational test in the emergency mode with a substantial power deficit and synchronization losses in the South power system. In this case, with a forced change in the direction of direct current power transmission in the power system by the operational personnel, the further spread of the emergency to the Donbass power system was prevented.

The power transmission system plays the role of intersystem coupling and is operated in accordance with the dispatcher control schedule specified by the TsDU YeES [central dispatcher control administration of the unified electrical power system of the USSR].

The accumulated experience was an important step in the development of the new direct current Ekibastuz—Tsentr power transmission system, as well as the Vyborgskaya direct current insert.

BIBLIOGRAPHY

1. Chuprakov, N.M., Posse, A.V., Milyutin, A.A., Shashmurin, V.M., ELEKTRICHESKIYE STANTSII [ELECTRIC POWER STATIONS], 1967, No 3.

2. Krasnopol'skiy, Ye.A., Kovalenko, Yu.P., ELEKTRICHESKIYE STANTSII, 1977, No 6.

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PROGRESSIVE METHODS OF OPERATING CENTRAL SCIENTIFIC RESEARCH LABORATORY

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNO-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 pp 36-37

[Article by V.S. Kharabadzhi, engineer]

[Text] Producing new and modernizing existing power equipment, the introduction of progressive methods of operating it, improving the technical economic indicators, cooperation with the scientific research centers of the nation and increasing labor productivity - this is a far from complete list of the major trends in increasing technical progress in Donbass power engineering.

In October of 1973, the Central Scientific Research Laboratory for Electrical Engineering (TsNIEL) was created in the "Donbassenergo" PEO for the purposes of also accelerating the growth in the efficiency of the solution of urgent scientific research problems, which come up in the practice of operating high power electrical engineering equipment.

The major subjects of study for the TsNIEL are: electrical power transmission at 110 KV and above, high voltage insulation and protection against overvoltages, relay protection, automation and power system mode control, and excitation systems for electrical machines.

The TsNIEL is at work in the main subject areas in the "Donbassenergo" PEO and other power associations of the Ukraine.

Specifically, the TsNIEL has been assigned the task of analyzing the operation of the "Donbass — Western Ukraine" ultrahigh voltage 750 KV power transmission system.

A large volume of scientific research was conducted on the power transmission system during the operational period (in conjunction with the NIIE [scientific research institute for power engineering], VEI [All-Union Order of Lenin Electrical Engineering Institute imeni V.I. Lenin], NIIPT [Scientific Research Institute for Direct Current] and the VNIIR [not further defined], which included the following: evaluating the operation of industrial prototypes of equipment and the conformity of its characteristics to operational requirements; checking the possibility of operating power transmission systems using time based schemes; measuring overvoltages and checking the operation of the system for protecting against them; studying steady-state modes and transient processes; studying automatic reclosing conditions, corona losses and radio interference; determining the dynamic characteristics of systems; testing experimental line relay protection devices; designed around integrated circuits [sic], etc.

Recommendations were developed and engineering designs adopted, directed towards improving operational reliability of equipment, as a result of the mastery of trial models and prototypes of equipment, relay protection devices and automation for 750 KV power transmission systems.

Recommendations were developed for the elimination of overheating of the ground cables of the neutrals of the AODTsTN-333000/750 autotransformers, as well as for not allowing the skewing of voltages on the low voltage side of the AODTsTN-417000/750/500 autotransformer. A compensation reactor was designed, fabricated and tested for a four-beam reactor circuit.

As a result of testing, the causes of the overheating of the clamping bolts of the RODTs-110000/750 reactor and the entrance defect of the 750 KV reactor were ascertained, and faults were detected in the rigid TVC plastic pipes of the RVMK-750 dischargers and prototypes of the VNV-330 and VNV-750 switches.

Procedures were developed for determing the location of a ground break in a cable for a 500 KV power line as well as principles for modernizing 750 KV disconnectors.

Defects in the circuits of the first semiconductor protection systems were ascertained and eliminated: the NDZ-750, DZ-750, and the AZVK-P transceiver of the NDZ-750M protection unit.

Operational experience with the 750 KV "Donbass — Western Ukraine" power transmission system is being systematically generalized in informational reports, produced once per biennium.

The "Donbassenergo" TsNIIEL is successfully introducing the method of gas chromatograph analysis of the gases dissolved in oil, for the operational monitoring of the condition of transformer and reactor insulation. Chromatographic monitoring of the gas composition now includes about 300 units of oil filled equipment, both in the Donbassenergo system, and in the "Donbass — Western Ukraine" 750 KV power transmission system.

A device has been designed at the TsNIEL for isolating the dissolved gases from the oil: a vacuum accessory for the chromatograph.

Procedures are being developed at the present time for determining the moisture and gas content of oil in transformers and reactors, and because of the use of chromatographs with greater resolution, work is underway for the purpose of accumulating experience in diagnosing turbine generator faults based on the composition of the impurities in the cooled gas.

The following applies to the major work on station equipment which has been performed at the level of new inventions: a diode-thyristor excitation system for the motor of ball pulverizers, a simplified automatic excitation controller for the auxiliary generator of an independent thyristor excitation system of an 800 MW turbine generator, a single machine (without a pilot exciter) high frequency excitation system for the 300 and 500 MW turbine generators of the Slavyanskaya GRES, and protection against interpolar short circuits in a high frequency excitation system. All of this work significantly increases the operational reliability of the power units.

Part of the work is being performed in conjunction with the diagnostics laboratory of the Uglegorskaya GRES, which was created in 1977.

These efforts include work on the study of a gas-oil system for 300 MW generators, the measurement of the vibration of the frontal sections of the stator winding of generators and the fastening effectiveness of the frontal arcs of the stator windings of motors, etc.

An instrument has been fabricated for the direct measurement of the temperature of the rotor winding of the exciter of the TVV-800-2 generator, as well as a laboratory vibration test stand for calibrating vibration transducers.

The following devices have been developed and introduced to increase the operational reliability of relay protection and automation: protection against shorts to ground on the generator voltage side of block generators working with an insulated neutral; protection without a dead zone for the case of short circuiting at any point in a generator circuit; a high speed directional current relay (BRTN) for advanced network splitting devices in the case of short circuits; synchronization and voltage monitoring relay (RKSN) for monitoring the voltage level on lines and buses of a substation as well as the angle between them (up to 70 electrical degrees); an undercurrent relay with minimal voltage interlocking and maximum current triggering (RMTN) to protect generators in the case of close three-phase short circuits which are not disconnected; a power limiting relay; a pulse width monitoring relay, etc.

devices used for testing electrical equipment which significantly increase the operational performance have been designed and fabricated at the TsNIEL.

They include the following: an infrared radiometer for measuring the temperature of electrical equipment parts at a distance; a current source for measuring the direct current resistance of the windings of transformers and electrical machines; a contact resitance meter for measuring the resistance of the contacts of electric power equipment (commutating units); a portable megohmeter for measuring the resistance of suspension and support type insulators with the working AC voltage applied; a breakdown voltage meter for diode type dischargers to measure a test voltage at the tap of a test transformer; an indicator for determining the locations and evaluating the danger of shorts between the rods of the stator winding of TGV-200 and TGV-300 turbine generators, etc.

About 100 scientific research and experimental design efforts have been carried out as a result of the 6 years of operation of the TsNIEL in conjunction with other organizations, as well as the publication of 60 technical reports on the laboratory's own designs, the submission of 47 patent claims for proposed inventions and the 27 patents.

Thus, the existence of the scientific research laboratory in the structure of the power engineering association makes it possible to solve important problems in the following areas: the analysis of the operational indicators of equipment and devices, and the dissemination of advanced experience; the acceleration of the introduction of completed scientific research work and experimental design work, performed by the nation's scientific research centers; the development of new models of electrical equipment and devices to improve the operational performance; the development and mastery of diagnostics methods and methods for predicting the condition of equipment, etc.

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SHIFTING AP-12 TURBINE OVER TO A DEGRADED VACUUM MODE

Moscow ENERGETIKA I ELEKTRIFIKATSIYA, NAUCHNO-PROIZVODSTVENNYY SBORNIK in Russian No 4, 1979 p 51

[Article by L.N. Belikov and L.M. Levitskiy, engineers]

[Text] Large, highly economical heating and condensation power units have been placed in service in power engineering over the last decade. Under these conditions, technically obsolete low power turbine sets cannot be competitive with modern large turbine installations. This is especially characteristic of the summer months of the year for heating set, when the output of heat to domestic consumers falls off sharply, as does the corresponding electrical power output for heating use. Thus, for example, the fuel consumption at the Kramatorskaya TETs increased in 1978 from 265 g/KWH in the winter months up to 430 g/KWH in the summertime, while the specific heat expenditures were from 1,500 Kcal/KWH up to 2,500 Kcal/KWH respectively.

A similar situation is also observed in the equipment of some other electrical power stations of the "Donbassenergo" PEO.

One of the methods of increasing the economy of obsolescent equipment is the shifting of turbines over to a degraded vacuum.

During April and May of 1978, the turbine generator of station No. 5, an AP-12 type with a capacity of 12 MW, was rebuilt at the Lisichanskaya TETs. The essence of the reconstruction (see the Figure) consisted in using the latent heat of steam formation in the turbine condenser for heating raw water routed to the clarifiers of the chemical water purification system (KhVO) from 20° up to 70° C.

Previously, the raw water was heated in special heaters by steam from the reduction-cooling installations of the boiler plants (ROU 30/13 and RSU 13/6 ata).

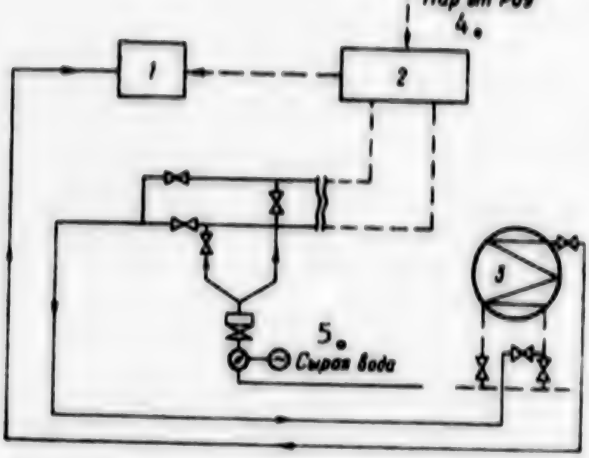

Figure. The configuration for the connection of the condenser of turbine generator No. 5 of the Lisichanskaya TETs for heating the raw chemical water purification water.

Key:
1. Chemical water purification;
2. Raw water heaters;
3. Turbine condenser;
4. Steam from the reduction-cooling installations of the boiler sets;
5. Raw water.

---- Old circuit;
—— New circuit.

The following work was done in changing the turbine over to a degraded vacuum mode: the removal of the last three stages; setting up condensate injection into the exhaust pipe; thermal insulation of the exhaust pipe and condenser; reconstruction of the condenser by means of increasing its runs up to four (instead of two) and increasing its strength; the installation of a piping circuit from the raw water pumps to the turbine condenser and from it to the chemical water purification clarifiers.

Following the reconstruction, the station No. 5 turbine set has been operating successfully in the degraded vacuum mode for more than 6,000 hours.

In this case, the monthly specific conventional fuel consumption has been reduced by 80 - 100 g/KWH, something which has produced an annual savings of 7,000 tons of conventional fuel. This savings is related to the use of the heat of the spent turbine steam for heating the raw water and the corresponding reduction in the consumption of reduced steam from the ROU for the internal needs of the TETs, as well as by eliminating the consumption of circulation water for the turbine condenser (a savings in electrical power for the drive of the circulation pumps).

The changeover of the other condensation type AT-25 turbine set of Station No. 3 to a degraded vacuum mode is also planned.

The essence of the reconstruction consists in changing the return mains water for heating the Lisichansk soda plant to the turbine condenser and heating it in the condenser up to 70° - 80° C by virtue of the condensation of the spent steam.

The indicated reconstructions of obsolete turbine sets make it possible increase the technical economic indicators with relatively low-cost measures.

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CURRENT DEVELOPMENTS IN CENTRAL HEATING DISCUSSED

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 2, Feb 80 pp 43-51

[Article by A. Nekrasov, department head of USSR Gosplan, and A. Troitskiy, deputy department head of USSR Gosplan]

[Text] The decree of CPSU Central Committee and the USSR Council of Ministers on the improvement of the economic mechanism sets the goal for all structural sections of the economy to achieve high final national economic results in administration and planning.

This is particularly important in application to the fuel and energy complex, since a balanced satisfaction of the country's needs in fuel and energy is becoming one of the factors determining the rate of the socioeconomic development of the country. Therefore, rational utilization and conservation of fuel and energy and involvement of new sources of fuel and energy resources, including renewable resources, are the most important national economic problems.

The consumption of fuel for the production of electric and thermal energy increases rapidly. In 1970, 570 million tons of conventional fuel was used for these purposes, 220 million of which was for energy conversion. In 1980, it is planned to produce in the USSR about 3,000 million Gcal of heat and 1295 billion kWh of electric energy, which will require 930 million tons of conventional fuel (about 60% of the total fuel used in the country), including 500 million (one third of fuel consumption) for the production of heat. The consumption for energy conversion reached almost 300 million tons of conventional fuel in 1979.

At the present time, the industry and municipal and domestic consumers of cities and workers' settlements receive more than three quarters of heat in the form of medium-potential steam and hot water from centralized sources: heat and electric power stations (TETs) of the USSR Minenergo [Ministry of Power and Electrification], industrial ministries and departments, as well as from industrial and municipal boiler houses with installed capacities of over 20 Gcal·h and heat-using units of industrial enterprises.

The delivery of heat from centralized sources, which is the most rational system of heat supply, will increase during this decade by a factor of 1.74, reaching 2260 million Gcal in 1980. This makes it possible to limit the delivery of heat from decentralized sources (boiler units with capacities below 20 Gcal·h, hot-water and steam boilers with capacities of 0.5-10 Gcal ·h, and other low-capacity sources of heat) at a level of 620-700 Gcal a year.

The dynamics of the balance of centralized heat supply is shown in Table 1.

Table 1

Sources and Consumers of Heat	Year						
	1970		1975		1980		1980 in % of 1970
	Million Gcal	%	Million Gcal	%	Million Gcal	%	
All TETs	700	54	918	52	1152	51	164.5
Including:							
TETs of USSR Minenergo	507	39.1	682	38.6	877	38.8	172.9
Industrial TETs	193	14.9	235	13.4	275	12.1	142.4
Boiler Units	547	42.2	765	43.2	973	43	177.8
Utilization Units	50	3.8	84.5	4.8	135	6.0	270
Total Produced and Delivered to Consumers	1297	100	1767.5	100	2260	100	174.3
Including:							
Delivered to Industry	1069	82.5	1421	80.4	1775	77.6	164
Delivered to housing facilities	212	16.4	327	18.5	480	21.2	226.4
Losses	15	1.1	20	1.1	85	1.1	166.6

In 1970, steam constituted 74% and hot water 26% of the total volume of thermal energy, while in 1980, there shares changed to 65.5 and 34.5 percent. Since 1975, facilities working on nuclear fuel produced about three million Gcal of heat,and in 1980, this figure will increase to 6-7 million Gcal.

During this decade, centralized delivery of heat to municipal and household consumers will increase by a factor of 2.25, which will have a positive effect on the ecological situation of urban agglomeration. Most buildings have all year round hot water supply, which requires about 20% of the total volume of heat spent on public and household needs of cities and workers' settlements.

Agricultural production is becoming one of the consumers of heat requiring centralized supply facilities (hothouses, preparation of feed, heating and ventilation of animal and poultry breeding buildings, etc). According to available estimates, at least 230 million Gcal of heat will be used for these purposes in 1980, besides the heating and the hot water supply of residential buildings.

The bulk of centralized heat is produced by heat and electric power stations whose installed capacities are steadily increasing, which can be seen from Table 2.

Table 2

Type of Equipment	Year						
	1970		1975		1980		1980 in % of 1970
	Million kW	%	Million kW	%	Million kW	%	
District Heating Turbines - Total	45.1	100	62.7	100	74	100	164
Including those Belonging to:							
USSR Minenergo	36.9	82	58.2	93	64.5	87	175
other ministries	8.2	18	4.5	7	9.5	13	116

District heating turbines operating at the present time are units with capacities from 5 to 250 MW. In 1980, more than 230 turbines with capacities of 100-250 MW will be operating.

The total productivity of steam boilers produced every year (in tons of steam per hour) is 100,000 Gcal·h (including boilers for electric power stations -- 44,500), and that of hot-water boilers is 80,000-85,000 Gcal·h. A total of about 155,000 steam and hot-water boilers are manufactured every year, which takes 300,000 tons of rolled steel and 250,000 tons of cast iron, including 140,000 tons of rolled steel and 250,000 tons of cast iron for manufacturing 152,000 small boilers with a capacity of up to 10 tons of steam per hour and up to 10 Gcal·h.

Until recently, peak-hour hot-water boilers have been produced. They worked reliably for a long time on gas, however, when they were changed to series mazut, they started failing due to external corrosion of heated surfaces. Since 1978-1979, production of hot-water boilers intended for working both on sulfurous mazut and on coal was started. Since several hundreds of peak-hour hot-water boilers intended for gas are being used at the present time, it is practical to use them for this fuel until they are replaced, and use mazut for steam boilers and other industrial installations adapted for this.

Due to the development of cities and settlements, agricultural farms and hothouse facilities, and creation of large industrial enterprises, the existing situation with heat and steam supply to the national economy from small boilers is not justifiable. Their production requires 2-2.5 times more specific consumption of rolled steel, higher labor and capital input, as well as a larger number of attending personnel and more fuel consumption for the production of heat in comparison with centralized heat supply systems.

The USSR Gosstroy has to reexamine the scale of boiler units in the direction of their enlargement and reduction of type sizes, and, in collaboration with the USSR Minenergo and USSR Ministry of Agriculture, to develop and implement measures for preventing unjustifiable dispersal of heat supply sources.

For the purpose of conservation and reduction of consumption of organic fuel for the production of heat, traditional measures are implemented regularly for the development of centralized heat supply, new capacities are introduced at TETs, and more up-to-date and larger district heating turbines and better peak-hour hot-water boilers are developed which are intended for burning gas-mazut fuel and coal. The stock of district-heating turbines is also expanded through reconstruction of condensation turbines for heat supply or by changing them to a lower vacuum.

The use of increasing numbers of peak hot-water boilers contributed to a better utilization of district-heating turbines and a higher effectiveness of heat supply.

Centralized heat supply must develop more effectively, be economically substantiated, and organically connected with the formation of the fuel and energy balance (TEB). Since the optimal directions of TEB formation depend on the region and are different for different geographical zones of the country, the development of centralized heat supply must be viewed in the regional aspect.

Table 3 shows the main variants of centralized heat supply which are possible in the future for the European regions of the country, the Urals, and Siberia. However, the variants of the heat supply sources on mazut and gas fuel shown in the table, particularly for the regions of the European part of the country, should be considered as conventional; due to the conditions of the fuel and raw material balance, the burning of these types of fuel in boilers should be limited in the future. The appropriate limitations are taken into consideration below in forming the conclusions for various regions. However, in order to form such conclusions, it is still necessary to compare the place of these variants in the economic ranking with other real sources of heat supply.

Table 3 does not show variants of heat supply which use solar energy, geothermal sources, and the burning of household trash since so far they are very much of local nature. However, in all instances when there is a practical economically substantiated possibility of using such sources of heat supply, they must be developed, first of all, because they do not require the use of fuel resources.

In order to evaluate the most practical directions in the development of centralized sources of heat supply in various regions of the country, the department of power and electrification of the USSR Gosplan performed appropriate comparative calculations of the variants presented in Table 3.

Before making conclusions from the results of the analysis, it is necessary to mention that it was not the purpose of the calculations to compare combined and separate methods of the production of heat and electric energy on the same types of organic fuel. Moreover, the calculations included such concentrations of capacities of centralized heat supply sources which are

Table 3

Heat Supply Sources	Regions		
	European Areas	Urals	Siberia
TETs:			
on Donets coal	+		
on Kuznetsk coal	+	+	
on Kansk-Achinsk coal			+
on Ekibastuz coal		+	
on mazut	+	+	+
on gas	+	+	+
Boiler Houses:			
on Donets coal*	+		
on Kuznetsk coal*	+	+	
on Kansk-Achinsk coal*			+
on Ekibastuz coal*		+	
on mazut*	+	+	+
on gas*	+	+	+
Atomic TETs*	+	+	+
Atomic Heat Supply Stations (AST)	+	+	+
Electric Boiler Houses:			
on AES electric power	+		
from GRES on mazut*	+		
from GRES on Kansk-Achinsk coal*			+
from GRES on Ekibastuz coal*		+	

*Compensation of the difference in the production of electric power in different variants is provided for at AES for the European regions, at Ekibastuz GRES for the Ural region, and at Kansk-Achinsk GRES for Siberia.

located in a zone of approximately equal effectiveness of both methods of production. Therefore, comparison of the of the combined and separate methods of the production of electric energy and heat for the same type of organic fuel used in both methods must be done in each specific case of the selection of a heat source with consideration for its real capacities and indexes. The main goal of the calculations is to reveal optimal directions for the development of heat production (by combined or separate method) with different possible fuel resources. Comparisons were done with respect to the total national economic capital investments and annual expenditures, including expenditures for heat and electric power generating capacities, difference in the expenditures on heat supply networks (for the ATETs [atomic heat and electric power station] and AST [atomic heat supply station] variants) and electric power networks (for the variants of electric power transmission to the Urals from Ekibastuz), expenditures on the extraction, production, and transportation of all types [illegible] resources, however without consideration for capital investments [illegible] supporting fuel extraction.

In all variants, the methods of calculations allowed for equal delivery of thermal energy for a given region. In using boiler houses of old types, as well as atomic TETs, its shortage was compensated by the production of electric energy by a method which is most effective for a given region, namely: at AES -- in European regions, at GRES using Kansk-Achinsk coal -- in Siberia and at Ekibastuz GRES with transmission of electric power -- for the Ural area.

The calculations took into account the design economic indexes characteristic of the appropriate large modern heating TETs and regional heating boiler rooms, and at ATETs and AST -- indexes according to the available at the present time projects approved in accordance with the established procedures.

The results of the calculations are presented in Table 4, where the examined variants for each region are arranged in their economic ranking according to the criterion of calculated expenditures with indications of the appropriate overall capital investments and annual expenditures.

The analysis of the results makes it possible to reveal the following directions of further development of the sources of centralized heat supply for the regions examined above with consideration for the appropriate national economic limitations.

In the European regions (without the Urals), it is most effective to build atomic heat and electric power stations. Taking into consideration the balance limitations with respect to the use of gas and the difficulties with the transportation of Kuznetsk coal to central and western regions, it is also practical to build atomic heat supply stations, since they have higher economic indices than TETs and boiler rooms working on Donetsk coal and mazut.

It is also necessary to take into consideration that, besides the balance limitation with respect to the use of gas, there are also special conditions of the operation mode of gas supply systems which make it necessary to use large amounts of standby mazut fuel at gas TETs and large boiler houses. Under these conditions, the economic advantages of gas TETs and boiler rooms in comparison with the use of Kuznetsk coal and even AST, in essence, level off.

As for the construction of heat supply sources working on Kuznetsk coal, it is sufficiently effective and can be carried out (in accordance with the possibilities of delivering this coal) in those cases when, due to the construction deadlines or a relatively small need in power, heat supply cannot be obtained from a nuclear energy source, or when the construction of such a heat source is not practical.

Calculations showed that the construction of TETs on Kuznetsk coal is equivalent in its effect to the construction of boiler houses on the same fuel in

Table 4 (in %)

Variants	Calculated Expenses	Capital Investments	Annual Expenses
European Part of the USSR (without the Urals)			
ATETs with additional production of electric energy at AES	100	100	100
TETs on gas	118	120	143
Boiler room on gas and AES	125	128	141
TETs on Kuznetsk coal	146	128	176
Boiler room on Kuznetsk coal and AES	147	138	165
AST and AES	149	150	141
Boiler room on Donetsk coal and AES	166	160	195
TETs on Donetsk coal	172	157	218
Boiler room on mazut and AES	173	157	215
TETs on mazut	192	165	250
Electric boiler rooms:			
on electric power from mazut GRES	407	403	525
on electric power from AES	465	403	518
Urals			
Boiler room on gas and transmission of electric power from Ekibastuz GRES	100	100	100
TETs on gas	100	101	105
TETs on Ekibastuz coal	106	114	103
Boiler room on Ekibastuz coal and transmission of electric power from Ekibastuz GRES	109	113	101
ATETs with additional production of electric energy at Ekibastuz GRES	110	114	100
TETs on Kuznetsk coal	112	114	116
Boiler room on Kuznetsk coal and transmission of electric power from Ekibastuz GRES	114	113	112
AST and transmission of electric power from Ekibastuz GRES	140	150	120
Boiler room on mazut and transmission of electric power from Ekibastuz GRES	152	147	176
TETs on mazut	180	176	218
Electric boiler room on the power of Ekibastuz GRES	346	349	261
Siberia (zone of the Integrated Power System)			
TETs on Kansk-Achinsk coal or a large boiler house and GRES on the same fuel	100	100	100
TETs on gas	101	106	115

Boiler room on gas and GRES on Kansk-Achinsk coal	101	105	120
ATETs with additional production of electric power at Kansk-Achinsk GRES	121	126	127
AST and Kansk-Achinsk GRES	148	136	151
TETs on mazut	215	192	300
Boiler room on mazut and Kansk-Achinsk GRES	225	200	330
Electric boiler room on power from Kansk-Achinsk GRES	292	300	274

combination with AES. However, it should be kept in mind that, as has been mentioned, calculations according to the existing methods did not take into account expenditures on supporting the extraction of organic fuel. If we take into consideration these additional expenses, then the construction of a TETs whose operation requires 1.5 times more organic fuel becomes practically less effective than the combination of a boiler room and an AES. Moreover, the reduction of physical volumes of the extraction and railroad transportation of fuel by replacing it with nuclear energy is of practical national economic significance. These considerations refer fully not only to Kuznetsk coal, but also to other types of organic fuel.

In recent years, proposals are made quite often for the construction of so-called maneuverable TETs in the European part of the USSR. According to the estimations of VNIPIenergoprom [All-Union Scientific Research and Planning Institute of the Power Industry], they are more effective than the combination of boiler rooms and maneuverable GRES on organic fuel. It is possible that these proposals will be of interest in long-range calculations, if effective ways of solving the problem of maneuverability without the use of organic fuel are not found (AES, GAES [pumped-storage electric power plants], accumulation, etc). However, in the next decade, it is more practical to change a considerable part of the TETs operating in the European part of the country to a maneuverable mode or a boiler-room mode (with electrical unloading of TETs during the hours of lower loads in the power system). When the maneuvering possibilities of condensation units are exhausted, this measure would make it possible not to increase, but to reduce the consumption of organic fuel for the production of electric energy by replacing it with nuclear energy.

With consideration for the above, it is possible to recommend the construction of ATETs, AST, and boiler rooms on Kuznetsk coal as the main direction for long-range development of centralized heat supply in this region of the country. Of course, in some individual cases, it is also possible to have other solutions based on certain specific circumstances. For example, when thermal loads are limited, when it is not practical to build ATETs and AST, and when there are difficulties with the transportation of Kuznetsk coal, it is possible to build boiler rooms on gas-mazut fuel or Donetsk coal.

It should be kept in mind that the additional resources of gas which the European part of the country will get as a boiler furnace fuel must be used, first of all, for the replacement of masut in order to increase the output of clear petroleum products which are needed by the national economy.

Other special solutions are possible also in those cases when the parameters of heat carriers which are necessary for the technological needs cannot be ensured at ATETs, AST, or the available stock of boilers for boiler rooms.

It is necessary to speed up the creation of larger boiler units for regional heating and large industrial boiler rooms, as well as sources of industrial heat supply on the basis of nuclear energy. At the same time, as can be seen from the cited data, it is not practical in the near future to use electric boiler rooms for centralized heat supply, even if they operate on electric power produced by atomic electric power stations.

In the Ural region, with consideration of the above reasons regarding the limitation of the use of gas, it is most practical to build TETs and boiler rooms operating on Ekibastuz or Kuznetsk coal, as well as ATETs. The selection of the type of the heat supply source (TETs or boiler room) must be done in a traditional way: separately in each specific case with consideration for the capacity and economic indexes of the sources. The effectiveness of heat supply of AST is lower than that of other sources operating on the basis of the above-mentioned coals. TETs and boiler rooms on masut, as well as electric boiler rooms, cannot be recommended as large sources of centralized heat supply.

In Siberia, TETs and boiler rooms heated with Kansk-Achinsk coal have a definite economic and practical priority. This, of course, does not apply to the gas-extracting regions of Tyumenskaya Oblast, where the absence of gas transportation problems removes the limitations on its use for heat supply.

The remaining types of heat sources have substantially lower economic indexes than TETs and boiler rooms operating on Kansk-Achinsk coal and, therefore, as a rule, cannot be recommended for wide use.

For other geographic regions of the country, as analysis indicates, it is most rational to use local fuel and energy resources. It is Ekibastuz mineral coal for Kazakhstan, Angren and other coals and local gas for Central Asia, local coals for the Far East, local coals and gas for the Yakut region, Inta coal and local gas for the northern and northeastern regions of the European part of the USSR, etc.

In the southern regions of Kazakhstan, in Central Asia and in the southern regions of the European part of the country, it is necessary to use solar energy widely as a source of heat supply, and to use geothermal energy in the regions with rich resources of thermal water (Transcaucasia, Kamchatka, and others).

Reserves for increasing the effectiveness of heat supply and reduction of the consumption of organic fuel should be involved and used everywhere: underloaded capacities of turbines with counterpressure, including their use as a source of peak-period heat; it is necessary to eliminate the disparities between thermal capacities and the carrying capacities of heat-supply networks. In large and medium-size cities, household wastes should be constantly utilized by burning them in hot-water boilers. The burning of tens of millions of tons of household wastes having heat value of 1,000-2,500 Kcal/kg will also make it possible to improve considerably the ecology of cities and suburban zones and to relieve the areas from garbage dumps.

It is practical to continue work on changing condensing turbines, including those with a capacity of 100,000, 150,000, and in individual instances of 200,000 kWh, to a district-heating mode, preserving, however, the necessary mobility of the power system.

With the planned large volumes of the construction of high-capacity capital-intensive atomic TETs and atomic heat supply stations, it is necessary to ensure their rapid loading with heat and release of organic fuel. In cities, where the increase of heat loads is planned in a relatively low rate, it is necessary to work out measures in advance for a rapid replacement of the operating boiler units, small ones first of all, and to prepare heat supply networks of the cities prior to this.

L. I. Brezhnev mentioned at the November (1979) Plenum of the CPSU Central Committee that, regardless of the rate of development of the power industry, heat and energy conservation will continue to be the most important statewide problem.

The main direction in the reduction of the expenditure (conservation) of heat must be measures carried out by its consumers. Calculations performed by the department of power and electrification of the USSR Gosplan indicate that only by reducing the norms of the consumption of thermal energy in the production of industrial products it will be possible in the next decade to save (a total of years) not less than 1000 million Gcal, and in the last year of that period -- 200 million Gcal.

Of course, the size of this economy will depend on the introduction of new energy-saving technology. Studies in the achievements of the domestic and foreign science indicate that such reserves are present in each sector of economy and in each type of production. They are power engineering units for the production of ammonia, methanol, nitric acid and other products in the chemical industry, autogenous melting processes of nonferrous metals in metallurgy, the dry method of manufacturing cement in the industry of building materials, etc.

Great reserves in the economy of fuel resources are yielded by the use of secondary heat resources. According to our evaluations, the size of useful utilization of secondary resources can increase in the next 10 years by 1.8 times, reaching about 230 million Gcal a year.

Huge amounts of low-potential heat are constantly ejected into the atmosphere and into water by industrial and various municipal units. Until the present time, no sufficient attention has been given to it in our country. At the present time, possible technical ways of its useful utilization have been determined and economically substantiated. Main of them are the use of heat pumps (both compression and, later on, electric), as well as recuperation of ventilation injections of industrial enterprises, particularly those with a high air-exchange ratio. Our evaluations indicate that by the end of the next decade, with consideration for the time necessary for starting series production of the appropriate equipment, the utilization of low-potential heat can reach approximately 90-100 million Gcal a year.

At the present time, by request of the Moscow TETs No 22, units with a capacity of 1 Gcal·h are being designed for the use of low-potential heat of waste water for heating hothouses with the aid of heat pumps; a similar unit of a greater capacity is being designed for the use of heat of the waste water of Kur'yanovskaya aeration station in Moscow.

Experience in the use of heat of ventilation ejections at the enterprises of the Ministry of Electronic Industry with the aid of revolving heat exchangers has shown that a temperature difference between the ejected air and the entering cold air of the order of 40 degrees C makes it possible to save up to 40-60% of heat spent for these purposes.

The above examples indicate great possibilities of conservation and involvement of nontraditional types of energy whose realization through timely manufacturing of the necessary equipment can yield more than one million tons of economy in fuel a year.

Designing organizations are faced with a big problem. They have to refine, reexamine, or develop new schemes of heat supply to cities, industrial centers, and workers' settlements with consideration for special characteristics of long-range fuel balance of the country as a whole, as well as of individual regions.

When reexamining and developing new schemes of heat supply and compiling heat balances, designing organizations must make provisions for and evaluate the volumes of its possible economy, involvement of new sources of heat, introduction of less heat-consuming industrial processes, involvement of renewable types of energy, lowering of the consumption of heat in residential and industrial buildings, a more complete utilization of TETs of industrial ministries and other measures directed toward rational construction of heat-supply schemes, and coordination of the operation modes of the traditional sources of heat with those new units which will be widespread in the near future.

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10,233
CSO: 1822

ELECTRIC POWER

BRIEFS

ANTICYCLONE DOWNS POWER LINES--The working people of Volosovskiy rayon in Leningradskaya oblast resisted the raging elements with fortitude and courage. A powerful anticyclone, passing over the Gulf of Finland and bursting onto the coastal territory, did not destroy the normal rhythm of life. By day it was warm and spring-like and the drip of melting snow could be heard, but in the evening a strong frost unexpectedly set in. Poles, posts and trees were covered in a thick coat of ice. Wires snapped under the weight and concrete posts collapsed. Big sovkhozes, forestry enterprises and many villages found themselves without electricity or telephone communications. The operations staff for combating natural disasters gave the alarm to the emergency teams of the Leningrad regional power supply administration. The anticyclone front advanced to a depth of more than 100 km, and the power workers did not have time to repair one break in the line before new reports of damage came in. The repair workers worked selflessly and were helped by sovkhoz teams. About 200 km of power transmission lines were put out of action by the anticyclone and hundreds of posts fell. Power workers from other rayons in the oblast and from Leningrad helped to combat the impact of the elements. The electricity supply to farms and settlements is now fully restored. [Text] [LD010715 Moscow IZVESTIYA in Russian 23 Mar 80 Morning Edition p 6 LD]

HEAT FROM MINI-ATOMIC POWERPLANTS--According to information in the regional ULYANOVSKAYA PRAVDA, an "experimental atomic station," designed to supply heat to private households and small industrial buildings, has been built at the "Lenin" scientific research institute for atomic reactors in Dmitrovgrad. As the newspaper explains, this is a prototype for mini-atomic powerplants which will be installed in the future in remote areas in the northern part of the Soviet Union, which cannot be hooked up to a power main and in which the heating supply must rely on liquid fuel. The prototype includes an atomic powerplant with a 5,000kw capacity which would be simple in design and easy to operate and which can be disassembled into blocks and also easily transported to its destination. The plant requires only 2 kg of nuclear fuel a year and produces as much power as a steam plant with an annual consumption of 1,500 tons of liquid fuel as its energy source. The mini powerplant should be "absolutely safe," and radioactive contamination of the thermal network should be "precluded." [Text][Bonn DIE WIRTSCHAFT DES OSTBLOCKS in German 28 Jan 80 p 5]

END

CSO: 1826

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